LEAGUE OF WOMEN VOTERS® OF WISCONSIN
EDUCATION FUND
122 State Street, #201A
Madison, WI 53703-2500
Phone: (608) 256-0827
Fax: (608) 256-1761
http://www.lwvwi.org
lwvwisconsin@lwvwi.org

February 11, 2010

To: Senate Select Committee on Clean Energy

Re: Support of Clean Energy Jobs Act (SB 450)

The League of Women Voters of Wisconsin has long advocated for policies that promise economic prosperity while protecting our state's precious natural resources. Following a two-year study on State Energy Policy, a united League membership in 2007 updated our positions on Global Warming and Electric Energy Policy. Since then we have advocated vigorously for policies that reduce atmospheric CO_2 and move Wisconsin toward cleaner sources of energy.

In 2007-2008 League members carefully followed the work of the Governor's Task Force on Global Warming, and our members testified at the hearings. We support the Task Force recommendations knowing they are the result of a thoughtful compromise by a distinguished group of individuals representing diverse interests.

The Clean Energy Jobs Act (CEJA) offers Wisconsin an unprecedented opportunity to move our state through the 21st century from a position of economic strength, environmental sustainability, and political leadership. We are in the midst of the worst recession in decades at the same time that we are experiencing rapidly accelerating impacts due to climate change. Tens of thousands of Wisconsin citizens are unemployed, schools and governments are experiencing severe financial stress, and the current effects of climate change right here in Wisconsin are imposing ever increasing burdens on our economy.

There is no doubt that part of the blame for these crises lies with our collective tendency to trade long term benefits for short term gain, our failure to plan for the future. Had we taken the long-term approach in the energy crisis of the 1970's, we would perhaps not be in the predicament we find ourselves today. The CEJA is an opportunity to do it right for the benefit of current and future generations. It will create jobs while it sets Wisconsin on the path to a clean energy economy.

<u>The CEJA will save money</u>
Modeling from the Technical Advisory Group of the Governor's Task Force on Global Warming showed that the financial impact of the suite of recommendations in the final report would be to *lower* electric bills across all sectors of our economy, not raise them.

Additional financial benefits of enacting these policies include: the jobs created, the avoided health costs associated with continuing with business as usual, the development of a more diversified portfolio of generation facilities, and, perhaps most importantly, the advantages of having prepared in advance for a carbon-constrained economy.

(more)

The CEJA will create jobs in Wisconsin

We need the Clean Energy Jobs Act to create the jobs of the future. Wisconsin has lost more than 150,000 jobs in the past year or two. This bill will create jobs now and in the future in those industries developing renewable resources as well as in the many businesses involved in implementing energy conservation and efficiency measures. By helping our state prepare now for a carbon-constrained economy, the CEJA will position Wisconsin to be a leader, not a loser.

The CEJA will put Wisconsin on the right track to transition to a carbon-constrained world

Task Force modeling projected that net greenhouse gas emissions in Wisconsin would return to 2005 levels by about 2014 if all modeled policies were adopted and implemented promptly. This is a conservative estimate and, like all modeling, dependent on assumptions about the future, including energy prices. But even allowing for a significant margin of error, the projection underscores the necessity for significant early action. The CEJA will give us an advantageous head start.

The CEJA must not be weakened

In the years since the Governor's Task Force began its work, the news about climate change has gotten worse, not better. The predicted trend towards more severe weather events, including both droughts and floods, is unfolding faster than the climate models have predicted, with dire and expensive consequences even here in Wisconsin.

It is therefore imperative that the CEJA not be weakened. The recommendations of the Task Force are already a compromise position reached by stakeholders representing a wide range of interests. This compromise should be respected as the result of a fair, open and thoughtful process.

In particular, the energy conservation and efficiency goals of 2% of electricity and 1% of natural gas must be firm goals. In addition, energy efficiency measures, while important, should not count towards the Renewable Portfolio Standard (RPS). To do so would result in less investment in renewable sources of electricity at a time when we must be investing more. We need both strong efficiency measures and a strong RPS.

The League of Women Voters of Wisconsin urges you to show your commitment to future generations by supporting the Clean Energy Jobs Act.

TO: Members of the Senate Select Committee on Clean Energy

FROM: Margi Kindig

DATE: February 10, 2010

RE: Clean Energy Jobs Act, SB 450

I was a citizen member of the Governor's Task Force on Global Warming. As such, I was one of only two members of the Task Force who did not represent a special interest or have an employer whose views I was obligated to reflect. I was free to bring an unbiased and common-sense perspective to the discussion.

These are a few things which are important to know about the task force process:

- This was a skillfully led, collaborative process in which no one's voice was stifled. Non-task force members as well as members of the public were welcome to participate.
- Costs were a very important and carefully considered subject of both discussion and modeling.
- The final report represents a delicate compromise which was carefully developed to achieve the widest possible support for the recommended policies.
- With a few exceptions, the consensus at the end of the process was that the recommended suite of policies represents a strong, effective, and achievable response to the enormous challenges posed by anthropogenic climate change.

Several principles should inform our discussion and guide our action as the CEJA is considered.

Observed events are unfolding more rapidly than climate models predicted

Climate models underestimated the speed at which projected changes would occur. Glaciers are melting more rapidly than predicted; the ocean is losing its ability to absorb carbon more quickly than expected; and 100-year weather events have already become much more commonplace. We are already paying dearly for our inaction of the past. Although we cannot automatically attribute any single severe weather event – such as the Lake Delton flood – to atmospheric carbon concentrations, the difference between isolated events on the one hand, and long term trends on the other is crucial. The trend is obvious.

We need all of the policies in the package

Modeling done for the Task Force projects that if all the recommended policies except cap and trade were implemented, Wisconsin's greenhouse gas emissions would return to 2005 levels by about 2014. Contrary to some peoples' suggestions, this does not mean the policies will lead to failure and we therefore shouldn't enact them; rather it means we need *all* the policies in this bill *now*, and may eventually need to do more as the future unfolds. Without these policies, emissions will rise substantially.

In order to maximize the benefits of all the recommended policies, it is important not to double count them. Energy efficiency and conservations measures should not be counted towards the RPS.

Energy Conservation and Efficiency Measures are the Cheapest, Easiest and Lowest Risk Options for Reducing Greenhouse Gas Emissions

There seems to be widespread agreement on this, but even this obvious point has been subject to some attack and manipulation to serve special interests. It is crucial that the savings achievement goals of 2% of electric use and 1% of natural gas use be firm. The language recommended in the memo from the Task Force co-chairs dated January 26, 2010 should be incorporated.

Early action is both crucial and cost-effective

Just like saving for retirement, early investment pays the greatest dividends, both in responding effectively to climate change and in absolute dollars.

Carbon dioxide stays in the atmosphere for about a century. Many of the impacts we are already experiencing and observing - movement and extinction of species, more severe weather events such as floods and droughts, and more chaotic climate generally – are the result of carbon emitted decades ago. Our emissions today add to the already accumulated carbon in the atmosphere. Obviously, getting to the now recommended 350 ppm from 385 ppm is easier than getting there from 400 or 450 ppm.

People are understandably concerned about adding *any* expense to their already stretched budgets. However, there has been little attention paid to the fact that early action will actually save us money in the long run. The careful modeling done by the Technical Advisory Group of the Global Warming Task Force shows that implementing the recommendations of the task force will actually **lower** electricity bills in the long run. (see attached chart presented at the Task Force's June 10, 2008 meeting.)

The cost of doing nothing will be much higher than the cost of acting now

There are few reliable studies about the costs of doing nothing to reduce our greenhouse gas emissions. The Stern Review is perhaps both the most extensive and the most reliable, and it showed that the cost of doing nothing could reach 20% of gross global product by 2050, while the cost of effective action to reduce greenhouse gas emissions over the same period of time is likely to be no more than 1-2%.

We may not be able to put an exact price tag on our failure to act, but we need look no further than Gays Mills, Lake Delton, and, most recently perhaps, Washington DC to know that chaotic climate is already costing us dearly.

This is not a partisan issue

Unfortunately, politics today has become so partisan, and so rooted in ideology, that neither facts nor the soundest science seem to guide policy-making. Why climate change should be a partisan issue is simply beyond comprehension. We are all in this together, and everyone's children and grandchildren will bear the burdens of our inaction.

For their sakes, we must act now and pass the Clean Energy Jobs Act.

Electricity Prices (Rates) in 2020			
% Change from Reference Case			% Change from High Fuel Reference Case
Sector	All Policies (except for Cap and Trade)	All Policies plus Deep Carbon Reductions	All Policies with 50% Higher Fuel Prices
Residential	10.9%	11.6%	9.1%
Commercial	13.5%	14.1%	11.0%
Industrial	15.9%	16.3%	12.4%
Average Retail	13.5%	14.1%	11.0%

Electricity "Bills" in 2020			
% Change in real $ cost from Reference Case			% Change from High Fuel Reference Case
Sector	All Policies (except for Cap and Trade)	All Policies plus Deep Carbon Reductions	All Policies with 50% Higher Fuel Prices
Residential	-10%	- 2.4%	- 3.7%
Commercial	- 7%	-16.7%	-16.7%
Industrial	- 5%	-17.0%	-16.3%

Senate
PUBLIC HEARING
Select Committee on Clean Energy

The committee will hold a public hearing on the following items at the time specified below:
Thursday, February 11, 2010
10:00 AM
411 South
State Capitol

Senate Bill 450

In addressing the goals of Senate Bill 450 (set forth below), I request the Committee's consideration of "Unglazed Solar Air Collectors (such as the SolarWall®) in addressing the various targets of the Bill. Specific benefits of Unglazed Solar Air Collectors as they relate to the various targets of the Bill (highlighted in YELLOW) are enumerated within the text of the Bill (below) and referenced in the accompanying hand-out.

Relating to: goals for reductions in greenhouse gas emissions *(GHG).*

*See the **C. D. Howe Research Report** (bookmarked w/YELLOW tab) which illustrates the economic benefits of this technology in mitigating GHG emissions relative to some of the more popular renewable energy technologies.*

for construction of zero net energy buildings and for energy conservation; information, analyses, reports, education, and training concerning greenhouse gas emissions

This technology affords the potential for 6 points toward Leadership in Enviornmental Engineering & Design (LEED) Certification (see RED tabbed bookmark).

and climate change; energy efficiency and renewable resource programs; renewable energy requirements of electric utilities and retail cooperatives; requiring electric utilities to purchase renewable energy from certain renewable facilities in their service territories; authority of the Public Service Commission over nuclear power plants; motor vehicle emission limitations; a low carbon standard for transportation fuels; the brownfield site assessment grant program, the main street program, the brownfields grant program, the forward innovation fund, grants to local governments for planning activities, the transportation facilities economic assistance and development program, a model parking ordinance; surface transportation planning by the Department of Transportation and metropolitan planning organizations to reduce greenhouse gas emissions; environmental evaluations for transportation projects; idling limits for certain vehicles; energy conservation codes for public buildings, places of employment, one- and two-family dwellings, and agricultural facilities; design standards for state buildings; energy efficiency standards for certain consumer audio and video devices, boiler inspection requirements; greenhouse gas emissions and energy use by certain state agencies and state assistance to school districts in achieving energy efficiencies;

X

Apart from the current FOCUS ON ENERGY grant for qualifying candidates within the WPS utilities service area (see section tabbed in BLUE) , the committee should encourage/fund FOCUS to expand this grant program statewide

creating an exception to local levy limits for amounts spent on energy efficiency measures; creating an energy crop reserve program; identification of private forest land, promoting sequestration of carbon in forests, qualifying practices and cost-share requirements under the forest grant program established by the Department of Natural Resources; air pollution permits for certain stationary sources reducing greenhouse gas emissions; allocating a portion of existing tax-exempt industrial development revenue bonding to clean energy manufacturing facilities and renewable power generating facilities; requiring a report on certain programs to limit greenhouse gas emissions; granting rule-making authority; requiring the exercise of rule-making authority; and providing a penalty.

By Senators Miller and Plale; cosponsored by Representatives Black and Soletski, by request of Governor James E. Doyle.

This hearing will involve topics related to Goals; Program Coordination and Evaluation; Public Education; State and Local Government; Cap and Trade Report

Wisconsin Council of Churches

750 Windsor Street, Suite 301 Sun Prairie, WI 53590-2149
Ph 608.837.3108 Fax 608.837.3038 E-mail wcoc@wichurches.org

TO: Senate Select Committee on Clean Energy
FROM: Peter Bakken, Coordinator for Public Policy
Wisconsin Council of Churches
RE: Clean Energy Jobs Act (SB 450 and AB 649)
DATE: February 11, 2010

My Name is Peter Bakken. I'm the Public Policy Coordinator for the Wisconsin Council of Churches, an association of thirteen Protestant and Christian Orthodox denominations in Wisconsin, including the Evangelical Lutheran Church in America, the United Methodist Church, the Presbyterian Church (USA), the United Church of Christ, and the Episcopal Church. Together, we comprise some 3000 congregations and almost a million members, and reach every corner of this state.

I am here to speak in support of the Clean Energy Jobs Act.

Across Wisconsin, churches and other faith communities have taken measures to reduce their use of fossil fuels by conserving energy, installing energy-efficient equipment, and adopting clean renewable energy sources.

Three Wisconsin churches have received EPA's Energy Star Congregations Awards for their achievements in energy conservation – Saint Andrews Lutheran church in Wausau, St. Therese Catholic Church in Appleton, and Madison Christian Community. Many more Wisconsin congregations have been featured in local and church media: First Presbyterian Church (Marshfield), First Unitarian Society (Madison), Christ the Servant Lutheran Church (Waukesha), Saints Peter and Paul Catholic Church in Green Bay, Saint Matthew Lutheran Church (Wauwatosa), Unitarian Universalist Church West (Brookfield), Lake Park Lutheran Church (Milwaukee), and Unity Lutheran Church (Milwaukee) – to name only a few.

They have done so for reasons that are highly relevant to the legislation we are discussing here today.

One reason is simply to exercise good stewardship by saving money. Congregations like businesses, households, and governments have finite budgets, and better things to spend money on than energy bills. These congregations have recognized that a short-term investment to reduce energy consumption yields long term returns that will enable them to better minister to their members and serve their neighbors in need.

In the same way, the Clean Energy Jobs bill can benefit the individuals, businesses, and communities of Wisconsin by promoting conservation and energy efficiency, ultimately lowering overall energy costs reducing the amount of money we send out of state by importing coal and oil to meet our energy needs.

A deeper motivation for these communities of faith, however, is to help secure a cleaner, healthier, and more just world for present and future generations. Our reliance on fossil fuels threatens the health of our most vulnerable neighbors today: neurological damage from mercury released into the atmosphere by the burning of coal; athsma from air pollutants; water poisoned by coal mining waste from mountaintop removal in Appalachia; toxic wastelands from the exploitation of Canadian oil sands; and so on. These are real and present costs that are not accounted for by our current system of energy pricing.

Further, it is clear that the projected consequences of climate change will fall most heavily on the poorest of the global poor, who have done the least to create the problem and who lack the resources to adapt to increases in drought, flooding, heat waves, sea level rise, and infectious diseases.

In short, these communities of faith have taken steps to reduce their energy consumption because it is the right thing to do – not only for the sake of maintaining the beauty, stability, and integrity of the creation, but also as a matter of justice for the least powerful and prosperous of our brothers and sisters.

The Clean Energy Jobs bill provides an opportunity for promoting justice as well as health here at home, provided we take steps to enable low-income people in Wisconsin to share in the economic benefits of a new clean energy economy. We therefore support the concerns of the Wisconsin Community Action Program Association that the final bill include measures to restore and protect the utility public benefits fund, and to help make new alternative energy and energy efficiency jobs pathways out of poverty.

Actions by a single congregation to employ renewable energy sources or conserve energy may not seem to amount to much, but this brings us to a final reason why people of faith have found it worthwhile to do so. As congregations – and households, communities, and even states – step forward to take constructive action, they set in motion the beneficial social contagion of exemplary leadership.

Exemplary leadership informs the imagination by showing that a better way is possible, that we have gifts of creativity and innovation that can leave a better world and a better way of life for our children and future generations.

Exemplary leadership removes the excuse of those who insist on waiting until others have taken the first step, by taking that step oneself. It recognizes that the actions of a single congregation, or state, are not taken in a vacuum. They are not sufficient in themselves, but they are part of a larger process of change. In taking responsibility for our own impact on the world, however limited, we influence the actions and perceptions of others.

The Clean Energy Jobs Act will demonstrate Wisconsin's determination to exercise exemplary leadership and the commitment of American citizens to take constructive action to solve our economic and environmental problems. We therefore respectfully urge this committee to recommend passage of SB 450.

Thank you for your time and your attention.

Wisconsin Transportation Builders Association
Associated General Contractors of Wisconsin
American Lung Association in WI
Associated Builders & Contractors of Wisconsin
Wisconsin Grocers Association
Owner-Operator Independent Drivers Assn., Inc.
WI Engine Manufacturers and Distributors Alliance
Miller-Bradford & Risberg, Inc.
Wisconsin Motor Carriers
Dane County
Inland Power Group
Brooks Tractor Inc.
Antigo Construction
Capitol Underground Inc.
Transport Refrigeration Inc.
Leonardo Academy
Wisconsin Kenworth Madison

February 11, 2010

Dear Senators Mark Miller and Jeff Plale, Co-chairs of the Clean Energy Committee, Senate and Assembly members,

Thank you for your work. As you continue your work on the Clean Energy Jobs Act, we would like to call your attention to one important provision designed to reduce diesel idling.

We, the undersigned, as members of the Wisconsin Clean Diesel Coalition (WCDC), are writing to urge you to rework this language by substituting provisions agreed to by our members and attached to this letter. We believe that this approach would be far more effective, and avoid some of the problems and shortfalls of the provision included in the Clean Energy Jobs Act.

Idling reduction is one of the most cost-effective ways to reduce ozone, particulate and greenhouse air emissions in a way that saves money and jobs.

Unnecessary vehicle idling creates air pollution that wastes fuel, causes air pollution, and increases our reliance on foreign oil. The idling of diesel vehicles, especially, is a source of particulate matter pollution, and contributes to portions of the state not meeting Environmental Protection Agency' Clean Air standards. Reducing avoidable idling is an attainable goal and has an immediate, positive impact on air quality and fuel consumption. This is why the WCDC strongly encourages the adoption of language that targets ***all*** commercial vehicles, which is the most effective way to reduce idling.

Many local governments and businesses have taken action to decrease vehicle idling. For example, Dane County and Madison limit idling of government vehicles and on city and county property. The City of Milwaukee has also enforced idling restrictions on all of their vehicles and conducts idling training for their equipment operators. Many school bus, trucking and other fleets have also established policies and/or created incentives to reducing idling among their equipment operators. The Clean Diesel Coalition has worked with all types of diesel fleets across the state to successfully reduce idling, clean up engines, and use cleaner fuels like ultra low sulfur diesel and bio-diesel.

A statewide approach provides a level playing field for businesses associated with the transportation and construction industry, while providing the benefits of decreased pollution throughout the state. A statewide regulatory framework will prevent the creation of islands of idling regulations across the state that could cause possible confusion.

Twenty other states, including Illinois, California, and Arizona regulate idling with exceptions based on weather, sleeping and rest, reasonable operation, and for emergency vehicles.

Wisconsin is also a leader in clean diesel technology with Cummins Emissions Solutions, Universal Silencer, Combustion Catalytic, Idle Free Systems and many other makers of clean diesel and idling reduction technologies based here. The Clean Air Task Force estimates that idling reduction and other clean diesel measures could save 100,000 lives over the next 21 years.

The language was negotiated with an involved process of key stakeholders including local officials, trucking, construction, school bus, transit, clean air, Departments of Natural Resources, Commerce and Transportation representatives.

We feel this language is better than the current bill language and Global Warming Taskforce language in several ways:

1. Covers commercial gasoline and diesel engines, both large sources of emissions;
2. Covers commercial on-road and off-road vehicles, both large sources;
3. Has fair exemptions to protect the health and safety of drivers and operators; and
4. Was created by the industries that will be impacted, ensuring higher compliance.

For all these reasons, we urge you to include this language in your final bill or make it a separate bill that can be passed in this session.

Thank you,

Brett Hulsey, Dane County Supervisor
Tom Walker, Wisconsin Transportation Builders Association
Tom Howells, Wisconsin Motor Carriers
Jim Boullion, Associated General Contractors of Wisconsin
Dona Wininsky, American Lung Association in WI
Steve Stone, Associated Builders & Contractors of Wisconsin
Brandon Scholz, Wisconsin Grocers Association
Joe Rajkovacz, Owner-Operator Independent Drivers Assn., Inc.
Myron Birschbach, Inland Power Group
Patrick R. George, Wisconsin Kenworth Madison
Mark Bentley, WI Engine Manufacturers and Distributors Alliance
Tom Gorst, Miller-Bradford & Risberg, Inc.
John Talbert, Antigo Construction
Doug Myers, Transport Refrigeration Inc.
John Rodgers, Leonardo Academy Inc.
Dennis Olson, Capitol Underground Inc.
Mary Kay Brooks, Brooks Tractor Inc.
Patrick Mackey, ESW Group

An Act to Conserve Fuel and Preserve Clean Air

Be it enacted by the People of the State of Wisconsin as follows:

Idling requirements for motor vehicles used for commercial purposes

1. **Applicability.** This section applies to:

   A. All motor vehicles used for commercial purposes on roads and for off-road activities, excluding vehicles operated completely by electric power;

   B. Locations where commercial motor vehicles load or unload.

2. **General requirement for loading and unloading locations.** A person who owns a location where a motor vehicle used for commercial purposes that is not subject to an exemption under subsection 4 loads or unloads may not cause a driver of that vehicle to idle for a period longer than 30 minutes by requesting that the vehicle continue running while waiting to load or unload at that location. To the maximum extent practical, a person subject to this subsection shall minimize delays in loading and unloading operations in order to reduce idling times.

3. **General requirement for vehicles.** An owner or operator of an on-road motor vehicle used for commercial purposes may not cause or permit such a vehicle to idle for more than 5 minutes in any 60-minute period except as provided in subsection 4.

An owner or operator of an off-road motor vehicle/equipment used for commercial purposes may not cause or permit such a vehicle/equipment to idle for more than 5 consecutive minutes when the equipment is not in use except as provided in subsection 4.

No idling shall be permitted by any motor vehicle used for commercial purposes within 100 feet of schools, daycares, elderly housing and hospitals that are clearly marked with signage visible from the roadway. For construction activity that involves off-road motor vehicles, the project manager has the responsibility to clearly mark the above-listed sensitive receptors on the plan documents with a 100 foot border delineated.

4. **Exemptions.** Subsection 3 does not apply for the period(s) when:

   A. Remains motionless because of traffic or an official traffic control device or signal or at the direction of a law enforcement official;

   B. Operating a defroster, heater, air conditioner, emergency lighting or installing equipment solely to prevent a safety or health emergency and not as part of a rest period;

   C. A police, fire, ambulance, public safety, military or other emergency or law enforcement
   vehicle idles while being used in the course of official business;

D. The primary propulsion engine idles for maintenance, servicing, repair or diagnostic purposes
if idling is required for such an activity;

E. Part of a state or federal inspection to verify that all equipment is in good working order if idling is required as part of the inspection;

F. Idling of the primary propulsion engine is necessary to power work-related mechanical or
electrical operations other than propulsion, including, but not limited to, mixing, dumping or
processing cargo; operating a lift, generator, crane, pump, drill, hoist, or other auxillary mechanical equipment; straight truck refrigeration, utility service restoration or to protect
prescription or over-the-counter drug products. This exemption does not apply when idling for
cabin comfort or to operate nonessential on-board equipment;

G. Off-road equipment or transit buses are in immediate stand-by mode for passenger loading/unloading, project and/or worker safety, for readiness of an upcoming phase of a specific project element, or is needed for a stop-and-go project element.

H. An armored vehicle idles when a person remains inside the vehicle to guard the contents or the
vehicle is being loaded or unloaded;

I. An occupied motor vehicle with a sleeper berth compartment idles for purposes of air conditioning or heating during a rest or sleep period;

J. Necessary for regeneration of exhaust emission control devices or to recharge batteries on a hybrid vehicle;

K. A passenger bus idles a maximum of 15 minutes in any 60-minute period to maintain passenger comfort while non-driver passengers are on board;

L. Idling due to mechanical difficulties over which the operator has no control if
the vehicle owner submits the repair paperwork or product receipt by mail within 30 days to
the appropriate authority verifying that the mechanical problem has been fixed. If no repair
paperwork is submitted within 30 days, the vehicle owner is subject to penalties as provided in
subsection 5;

M. Warming up to the manufacturer's recommended operating temperature;

N. An on-road motor vehicle idles for not more than fifteen (15) consecutive minutes per hour when the outside temperature is above 75 degrees F or below 40 degrees F. No time limit for off-road equipment when temperatures are outside of these ranges.

O. The outside temperature is below 10 degrees F the restrictions of this law will not apply.

5. Penalties. Any owner and/or operator of a motor vehicle used commercially and/or owner of a load/unload location who violates this section is subject to a forfeiture of $150.00 for each violation.

6. Preemption. This act shall preempt and supersede a local ordinance or rule concerning the subject matter of this act.

COMPARISON OF IDLING REDUCTION PROVISIONS

SB 450/AB 649	WI Clean Diesel Coalition
SIMILARITIES	
Duration: 5 min allowed per 60 minutes	SAME
Exemptions: AB 649 language includes exemptions for traffic conditions, temperature, work-related mechanical operations, regeneration of emission controls, maintenance procedures.	Includes exemptions similar to AB 649, but WCDC has additional exemptions beyond the current language since so many types of vehicles would be impacted. The additional exemptions include: operating defroster, lighting and other controls during work (not rest) for safety and health; emergency and law enforcement vehicles; state and federal inspections; stand-by modes for transit and construction; armored vehicles; trucks with sleeper berths while on rest periods; mechanical difficulties with proof of issue; warm up.
DIFFERENCES	
Applicability: Current language only affects trucks	WCDC version is for all commercial equipment and load/unload locations
Penalties: Current language indicates $20-$1,000 depending on number of offenses	WCDC indicates $150 for each violation
Temperature: Current language for temperature is for below 10 degrees F and above 90 degrees F.	WCDC completely exempts below 10 degrees F and allows for 15 minutes per 60 minutes when below 40 degrees F or above 75 degrees F.

Senate Select Committee on Clean Energy

Public Hearing
Thursday, February 11, 2010
10:00 a.m.
411 South, State Capitol

Testimony on SB 450 by:
Robert Jones, Public Policy Director
Wisconsin Community Action Program Association (WISCAP)

Good morning. Thank you for the opportunity to testify today.

My name is Bob Jones. I am the Public Policy Director for the Wisconsin Community Action Program Association (WISCAP). WISCAP is the statewide trade association for Wisconsin's sixteen Community Action Agencies and three special-purpose agencies – the Coalition of Wisconsin Aging Groups, the Foundation for Rural Housing and United Migrant Opportunities Services (UMOS) – with statewide anti-poverty missions. Community Action Agencies are private, not-for-profit, locally-controlled organizations which provide services to help low-income families become economically self-sufficient and to grow the communities in which they reside.

There is general consensus that low-income households will be particularly vulnerable to the economic impacts of rate changes and other strategies designed to increase energy efficiency, expand renewables and provide for the other commendable objectives of the Clean Energy legislation. The Governor's Task Force on Global Warming acknowledged this fact in developing its recommendations by setting up a low-income workgroup to examine these impacts. In its report to the full Task Force, the Low-Income Workgroup stated:

> The Governor's Task Force on Global Warming is concerned that appropriate and necessary steps to impact the problem of global warming in Wisconsin will have an adverse effect on Wisconsin's low income residents. These households are already struggling to become economically self-sufficient and doing so under mixed conditions, depending on their employment skills, local job markets, rural or urban residence, educational opportunities, family size and other conditions. Wisconsin has a proud history of being committed to equal opportunity for all its citizens, and it is incumbent to

honor that history by ensuring that efforts are made to mitigate the impacts of global warming policies on the economic burdens of low income households, consistent with the philosophy of 'a hand up – not a hand out.'

These impacts can be profound and diverse; they will affect low-income households beyond the traditional aspects of low-income weatherization and bill payment assistance and deal with such issues as transportation and food security. Many of the solutions will have to wait for federal action – and there are some very intriguing studies and thoughtful suggestions in this area being done on the federal level – because that is where the resources will come from, through 'cap and trade' or whatever.

But, in the context of the Clean Energy Jobs Act, there are three (3) specific steps we would ask you to consider that are feasible on a state level to protect and help low-income households benefit from the movement to clean energy.

First, low-income households will be particularly vulnerable to price signals sent by the market in an attempt to encourage conservation and energy efficiency and to rate impacts driven by policy implications of this legislation. Wisconsin already has a robust funding mechanism to provide energy assistance – both weatherization/energy conservation and bill payment assistance – to low-income households and one capable of absorbing these changes. This mechanism is the state's low-income public benefits program. However, the past two budget cycles have seen funds transferred from the low-income public benefits program for non-energy purposes. The state does not need to create a new mechanism to protect low-income families and individuals. It simply needs to protect the program it has. This fund will be needed more than ever and we would ask that language be included in the Clean Energy Jobs Act that (1) restores the revenues transferred from the utility public benefits fund over the past two bienniums that could go to low-income energy assistance ($36,743,000) and (2) would require more analysis, contemplation and public input before the consideration of any future transfers from the fund. Our suggestion is that this would be done by requiring: (a) any such transfer would be authorized by the Assembly and Senate standing committees with jurisdiction over utilities (as well as Joint Finance) and that a public hearing be held as part of that process; (b) that the statutory 3% ceiling on the low-income assistance fee automatically increase to an amount sufficient to equal the amount of any approved transfer; and (3) that Class A utilities, cooperatives and municipalities be required to notify their customers of the increase in the low-income assistance fee and transfer a minimum of sixty (60) days prior to implementation.

Our second recommendation deals with jobs. We are all looking to the Clean Energy Jobs Act to serve as a job creation engine. Jobs and business development are a critically important pathway for low-income individuals in their journey towards economic self-sufficiency and Wisconsin's CAAs are strongly committed to locally-driven, creative job and business development programs. It is imperative that the opportunities inherent in the creation of a green jobs economy in Wisconsin not be lost to the state's low-income workers and would-be entrepreneurs. These future jobs represent a pathway out of poverty and we must make sure that we provide the access, training and opportunity sufficient to allow low-income individuals to help shape their future.

To the extent the Clean Energy Jobs Act will be quantifying its job creation, business development and related training and development activities, we would ask that language be inserted to ensure low-income households have access to that process. We would offer as suggestions for consideration such things as the provision of tax credits for employers who hire low-income individuals in jobs created by the Act; creation of programs like the Community Action Skills Enhancement and Job and Business Development models that provide technical school training and job placement/support services to low-income households in growing technologies related to alternative energy and energy efficiency jobs; and language which requires measurement of the number of jobs – and jobs held by low-income individuals – which are created as a result of the Clean Energy Jobs Act.

Lastly, the Clean Energy Jobs Act expands the scope of the current energy efficiency programs to include users of liquid petroleum (LP) gas and heating oil. We would ask that this language be expanded to include these users in low-income programs as well. A substantial portion of low-income households, particularly in rural areas, use these fuels. In 2009, 7,910 heating oil users received bill payment assistance as did 19,005 LP users. So far this heating

season, 7,759 heating oil users have received bill payment and 19,842 LP users have received assistance. So this would be a worthwhile and justifiable expansion.

Thank you for the opportunity to share these thoughts. I would be happy to answer any questions and I look forward to discussing our ideas with the Committee in further detail.

Bob Jones,
Public Policy Director
Wisconsin Community Action Program Association (WISCAP)
1310 Mendota Street, #107
Madison, Wisconsin 53714
608.244.0466
bjones@wiscap.org

SIERRA CLUB
FOUNDED 1892

John Muir Chapter

Sierra Club - John Muir Chapter
222 South Hamilton Street, Suite 1, Madison, Wisconsin 53703-3201
Telephone: (608) 256-0565 Fax: (608) 256-4562
shahla.werner@sierraclub.org http://wisconsin.sierraclub.org

Support SB 450 / AB 649, The Clean Energy Jobs Act
Before the Select Committee on Clean Energy, 02/11/10, RM 411S,
Dino Zucchi, Volunteer Lobbyist, Sierra Club- John Muir Chapter

First, I would like to thank Committee co-chairs Miller and Plale for holding this public hearing on the Clean Energy Jobs Act today. My name is Dino Zucchi and I am a volunteer lobbyist for the Sierra Club – John Muir Chapter. The Sierra Club is grateful to have the opportunity to speak to you today about cap and trade and state and local government provisions of the Clean Energy Jobs Act.

The Sierra Club is very pleased to see the Clean Energy Jobs Act moving forward. However, we are concerned that some of policies from the Global Warming Task Force recommendations that were omitted from this bill will prevent us from meeting key greenhouse gas reduction targets needed to protect our state's economy and natural resources. Specifically, including language in SB 450 that authorizes Wisconsin to participate in a regional or national broad based cap and trade program that establishes a price for greenhouse gas emissions was referred to in the GWTF report as being essential to meeting our emissions reduction goals of reducing greenhouse gas emissions by 75% from 2005 levels by 2050. Including stronger language with regards to regulating greenhouse gas emissions would have established Wisconsin as a leader in developing this critical policy. Instead, the Clean Energy Jobs Act directs the Wisconsin Department of Natural Resources (WDNR) to create a report for the Governor and state legislature once a regional or national cap and trade system is established. We don't feel that this provision is adequate to ensure that Wisconsin will have an active, lead role in developing this important policy.

The Sierra Club fully agrees with provisions in the Clean Energy Jobs Act that directs state agencies, including the WDNR and the UW System to evaluate and implement plans to reduce their greenhouse gas emissions to 22% below their 2005 emissions by January 1, 2020. Wisconsin's state-owned health facilities and institutes of higher learning should be models. Currently, this is not the case, as over a dozen state-owned facilities in Wisconsin are burning coal, and this is at odds with the University of Wisconsin's statewide mission to "educate people and improve the human condition." It is Sierra Club's hope that passing the provisions for our state government to be a leader in the Clean Energy Jobs Act will encourage the transition to cleaner fuels.

Finally, the Sierra Club strongly supports excluding expenditures made by municipal governments on energy projects from levy limits. This is good public policy that will save money and energy, and it has already been enacted for Wisconsn's schools in as part of the state's biennial budget. Since 2005, the Sierra Club has been encouraging local communities to implement climate action plans as part of our Cool Cities program, and policies like these will enhance the ability of local communities to meet greenhouse gas reduction targets.

Thank you for your sincere consideration on the Clean Energy Jobs Act. We urge you to pass this vital bill this session without weakening amendments.

abc NEWS

New Wind Farms in the U.S. Do Not Bring Jobs

Millions Have Been Invested in Wind Farms, but That Hasn't Brought Jobs

By JONATHAN KARL

Feb. 9, 2010—

Despite all the talk of green jobs, the overwhelming majority of stimulus money spent on wind power has gone to foreign companies, according to a new report by the Investigative Reporting Workshop at the American University's School of Communication in Washington, D.C.

Nearly $2 billion in money from the American Recovery and Reinvestment Act has been spent on wind power, funding the creation of enough new wind farms to power 2.4 million homes over the past year. But the study found that nearly 80 percent of that money has gone to foreign manufacturers of wind turbines.

So Where Are the Jobs?

"Most of the jobs are going overseas," said Russ Choma at the Investigative Reporting Workshop. He analyzed which foreign firms had accepted the most stimulus money. "According to our estimates, about 6,000 jobs have been created overseas, and maybe a couple hundred have been created in the U.S."

Even with the infusion of so much stimulus money, a recent report by American Wind Energy Association showed a drop in U.S. wind manufacturing jobs last year.

Sen. Chuck Schumer, D-N.Y., called the flow of money to foreign companies an outrage, because the stimulus, he said, was intended to create jobs inside the United States.

"This is one of those stories in Washington that when you tell people five miles outside the Beltway, or anywhere else in America, they cannot believe it," Schumer told ABC News, "It makes people lose faith in government, and it frankly infuriates me."

Matt Rogers, the senior adviser to the Secretary of Energy for the Recovery Act, denied there was a problem.

"The recovery act is creating jobs in the U.S. for American workers," said Rogers, "That is what the recovery act is about, that is what it is doing. Every dollar from the recovery act is going to create jobs for the American workers here in the U.S."

How Did This Happen?

Several of the large European turbine manufacturers had limited manufacturing facilities in the United States, but there was nothing in the stimulus plan that required that the turbines, or any other equipment needed for the wind farms, be made here, said Rogers. There are strict "Buy America" provisions in the

Recovery Act, but this Green Energy Stimulus initiative turned the existing tax credits into cash grants, bypassing the "Buy America" provision.

Iberdrola, one of the largest operators of renewable energy worldwide, is based in Spain and has received the most U.S. stimulus dollars -- $577 million. It buys some of its turbines from another Spanish manufacturer, Gamesa, which has a U.S. connection. Gamesa has two facilities to manufacture turbine blades in Pennsylvania, but the company said the market forced it to temporarily lay off nearly 100 workers.

Eric Sheesley was one of those laid off from the Gamesa plant before Thanksgiving. "When we're employing other countries, we can't feed our kids at home. It gets hard you know." Sheesley had a glimmer of hope when a letter arrived this week telling him to report back to work next week.

One reason so much money is going overseas is that there is not much of a wind power industry in the United States -- only two major American manufacturers make wind turbines: General Electric Energy and Clipper Wind based in Carpinteria, Calif. Even those companies do a significant amount of their manufacturing overseas. General Electric told ABC News that GE's Renewable Energy business has 3,000 employees around the world, 1,350 here in the United States.

Schumer said the way to revitalize the domestic wind power industry and to create green jobs is to require that at least some of the turbine equipment to be made in the United States.

An American Farm With Chinese Jobs

Perhaps the most controversial wind project is one that has yet to receive stimulus money.

A Chinese company called A-power is helping to build a massive $1.5 billion wind farm in West Texas. The consortium behind the project expects to get $450 million in stimulus money.

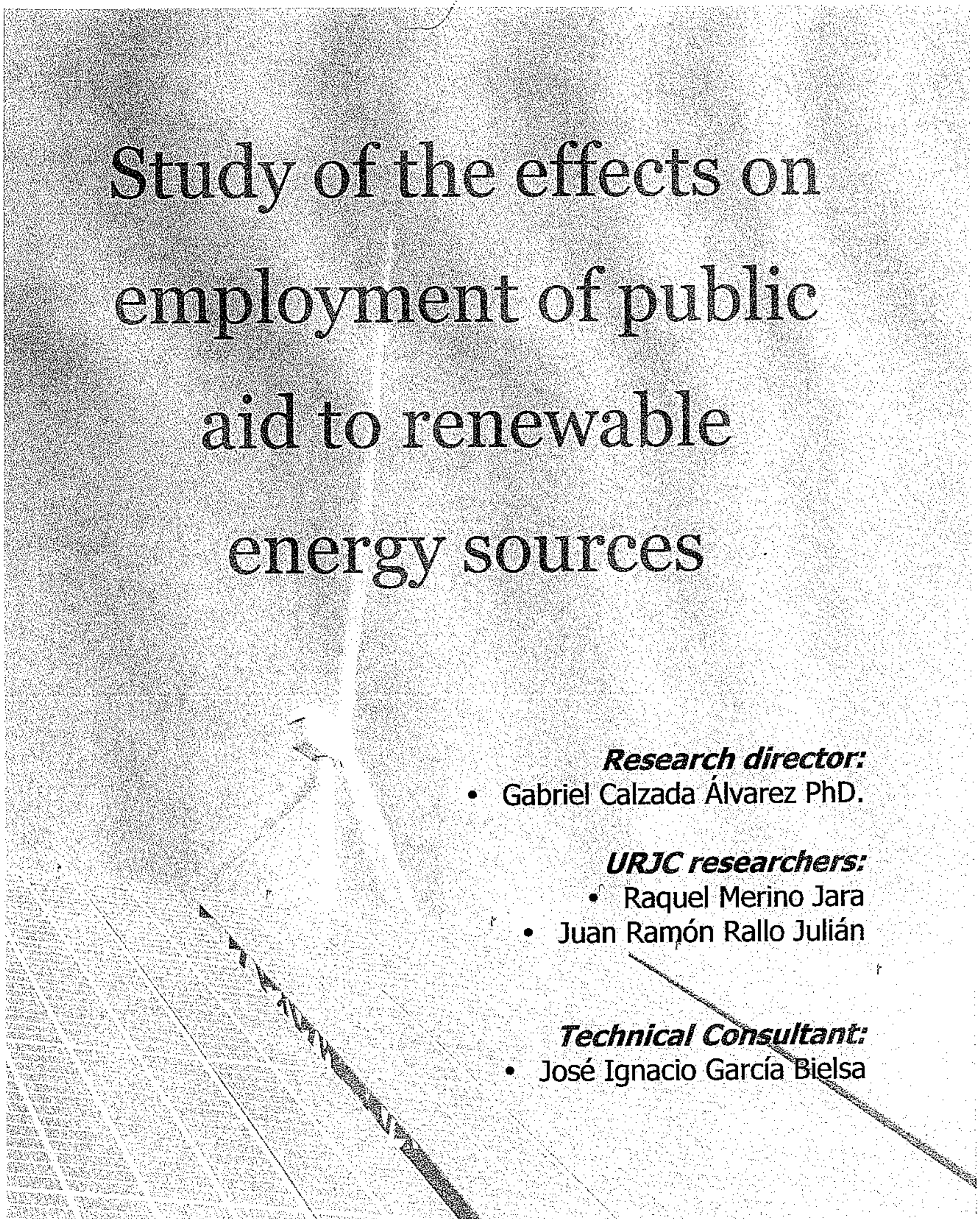
Walt Hornaday, an American partner on the project, said it would create some American jobs. "Our estimation," he said, "is that we are going to have on the order of 300 construction jobs just within the fence of the project."

But that's in addition to 2,000 manufacturing jobs -- many of them in China.

Lauren Reynolds, a reporter at ABC's San Diego affiliate 10 News, paid a visit to the vacant office of A-power.

To read more about how wind energy companies in San Diego are forced to spend their federal stimulus dollars abroad, go to today's San Diego Tribune and the Watch Dog Institute's Web page.

March 2009



Study of the effects on employment of public aid to renewable energy sources

Research director:

- Gabriel Calzada Álvarez PhD.

URJC researchers:

- Raquel Merino Jara
- Juan Ramón Rallo Julián

Technical Consultant:

- José Ignacio García Bielsa

Paula Quinn
262|361-4225

Universidad
Rey Juan Carlos

BORRADOR
DRAFT

EXECUTIVE SUMMARY: LESSONS FROM THE SPANISH RENEWABLES BUBBLE

Europe's current policy and strategy for supporting the so-called "green jobs" or renewable energy dates back to 1997, and has become one of the principal justifications for U.S. "green jobs" proposals. Yet an examination of Europe's experience reveals these policies to be terribly economically counterproductive.

This study is important for several reasons. First is that the Spanish experience is considered a leading example to be followed by many policy advocates and politicians. This study marks the very first time a critical analysis of the actual performance and impact has been made. Most important, it demonstrates that the Spanish/EU-style "green jobs" agenda now being promoted in the U.S. in fact destroys jobs, detailing this in terms of jobs destroyed per job created and the net destruction per installed MW.

The study's results demonstrate how such "green jobs" policy clearly hinders Spain's way out of the current economic crisis, even while U.S. politicians insist that rushing into such a scheme will ease their own emergence from the turmoil.

The following are key points from the study:

1. As President Obama correctly remarked, Spain provides a reference for the establishment of government aid to renewable energy. No other country has given such broad support to the construction and production of electricity through renewable sources. The arguments for Spain's and Europe's "green jobs" schemes are the same arguments now made in the U.S., principally that massive public support would produce large numbers of green jobs. The question that this paper answers is "at what price?"

2. Optimistically treating European Commission partially funded data[1], we find that for every renewable energy job that the State manages to finance, Spain's experience cited by President Obama as a model reveals with high confidence, by two different methods, that the U.S. should expect a loss of at least 2.2 jobs on average, or about 9 jobs lost for every 4 created, to which we have to add those jobs that non-subsidized investments with the same resources would have created.

[1] The MITRE project was partially funded by DG TREN (Energy & Transport) of the European Commission under the Altener programme.

3. Therefore, while it is not possible to directly translate Spain's experience with exactitude to claim that the U.S. would lose at least 6.6 million to 11 million jobs, as a direct consequence were it to actually create 3 to 5 million "green jobs" as promised (in addition to the jobs lost due to the opportunity cost of private capital employed in renewable energy), the study clearly reveals the tendency that the U.S. should expect such an outcome.

4. At minimum, therefore, the study's evaluation of the Spanish model cited as one for the U.S. to replicate in quick pursuit of "green jobs" serves a note of caution, that the reality is far from what has typically been presented, and that such schemes also offer considerable employment consequences and implications for emerging from the economic crisis.

2/3 of jobs are temporary

1/10th - perm

5. Despite its hyper-aggressive (expensive and extensive) "green jobs" policies it appears that Spain likely has created a surprisingly low number of jobs, two-thirds of which came in construction, fabrication and installation, one quarter in administrative positions, marketing and projects engineering, and just one out of ten jobs has been created at the more permanent level of actual operation and maintenance of the renewable sources of electricity.

6. This came at great financial cost as well as cost in terms of jobs destroyed elsewhere in the economy.

$780,000

7. The study calculates that since 2000 Spain spent €571,138 to create each "green job", including subsidies of more than €1 million per wind industry job.

$1.3

8. The study calculates that the programs creating those jobs also resulted in the destruction of nearly 110,500 jobs elsewhere in the economy, or 2.2 jobs destroyed for every "green job" created.

9. Principally, the high cost of electricity affects costs of production and employment levels in metallurgy, non-metallic mining and food processing, beverage and tobacco industries.

10. Each "green" megawatt installed destroys 5.28 jobs on average elsewhere in the economy: 8.99 by photovoltaics, 4.27 by wind energy, 5.05 by mini-hydro.

11. These costs do not appear to be unique to Spain's approach but instead are largely inherent in schemes to promote renewable energy sources.

12. The total over-cost - the amount paid over the cost that would result from buying the electricity generated by the renewable power plants at the market price - that has been incurred from 2000 to 2008 (adjusting by 4% and calculating its net present value [NPV] in 2008), amounts to 7,918.54 million Euros (appx. $10 billion USD)

13. The total subsidy spent and committed (NPV adjusted by 4%) to these three renewable sources amounts to 28,671 million euros ($36 billion USD).

14. The price of a comprehensive electricity rate (paid by the end consumer) in Spain would have to be increased 31% to being able to repay the historic debt generated by this rate deficit mainly produced by the subsidies to renewables, according to Spain's energy regulator.

15. Spanish citizens must therefore cope with either an increase of electricity rates or increased taxes (and public deficit), as will the U.S. if it follows Spain's model.

16. The high cost of electricity due to the green job policy tends to drive the relatively most electricity-intensive companies and industries away, seeking areas where costs are lower. The example of Acerinox is just such a case.

17. The study offers a caution against a certain form of green energy mandate. Minimum guaranteed prices generate surpluses that are difficult to manage. In Spain's case, the minimum electricity prices for renewable-generated electricity, far above market prices, wasted a vast amount of capital that could have been otherwise economically allocated in other sectors. Arbitrary, state-established price systems inherent in "green energy" schemes leave the subsidized renewable industry hanging by a very weak thread and, it appears, doomed to dramatic adjustments that will include massive unemployment, loss of capital, dismantlement of productive facilities and perpetuation of inefficient ones.

18. These schemes create serious "bubble" potential, as Spain is now discovering. The most paradigmatic bubble case can be found in the photovoltaic industry. Even with subsidy schemes leaving the mean sale price of electricity generated from solar photovoltaic power 7 times higher than the mean price of the pool, solar failed even to reach 1% of Spain's total electricity production in 2008.

19. The energy future has been jeopardized by the current state of wind or photovoltaic technology (more expensive and less efficient than conventional energy sources). These policies will leave Spain saddled with and further artificially perpetuating obsolete fixed assets, far less productive than cutting-edge technologies, the soaring rates for which soon-to-be obsolete assets the government has committed to maintain at high levels during their lifetime.

20. The regulator should consider whether citizens and companies need expensive and inefficient energy – a factor of production usable in virtually every human project- or affordable energy to help overcome the economic crisis instead.

21. The Spanish system also jeopardizes conventional electricity facilities, which are the first to deal with the electricity tariff deficit that the State owes them.

22. Renewable technologies remained the beneficiaries of new credit while others began to struggle, though this was solely due to subsidies, mandates and related programs. As soon as subsequent programmatic changes take effect which became necessary due to "unsustainable" solar growth its credit will also cease.

23. This proves that the only way for the "renewables" sector - which was never feasible by itself on the basis of consumer demand - to be "countercyclical" in crisis periods is also via government subsidies. These schemes create a bubble,

which is boosted as soon as investors find in "renewables" one of the few profitable sectors while when fleeing other investments. Yet it is axiomatic, as we are seeing now, that when crisis arises, the Government cannot afford this growing subsidy cost either, and finally must penalize the artificial renewable industries which then face collapse.

24. Renewables consume enormous taxpayer resources. In Spain, the average annuity payable to renewables is equivalent to 4.35% of all VAT collected, 3.45% of the household income tax, or 5.6% of the corporate income tax for 2007.

CHAPTER 4. THE ECONOMICS OF ARTIFICIAL JOB CREATION: A CALCULATION OF THE COST OF GREEN JOBS ON THE REST OF PRODUCTIVE ACTIVITY

Public investment in renewable energy has job creation as one of its explicit goals, which, given the current economic crisis, suggests an intention of seeding a future recovery with "green job" subsidies. The problem with this plan is that the resources used to create "green jobs" must be obtained from elsewhere in the economy. Therefore, this type of policy tends to create not just a crowding-out effect but also a net destruction of capital insofar as the investment necessary must be subsidized to a great extent and this is carried out by absorbing or destroying capital from the rest of the economy.

The money spent by the government cannot, once committed to "green jobs", be consumed or invested by private parties and therefore the jobs that would depend on such consumption and investment will disappear or not be created.

Investment in green jobs will only prove convenient if the expense by the public sector is more efficient at generating wealth than the private sector. This would only be possible if public investment were able to be self-financing without having to resort to subsidies, i.e., without needing to absorb wealth generated by the rest of the economy in order to support a production that cannot be justified through the incurred incomes and costs. We have calculated that the total public subsidy in Spain, both spent and committed, totals 28,671 million Euros (€28.7 billion or appx. $37 billion USD), and sustains 50,200 jobs.

In order to know how many net jobs are destroyed by a green job program for each one that it is intended to create, we use two different methods: with the first, we compare the average amount of capital destruction (the subsidized part of the investment) necessary to create a green job against the average amount of capital that a job requires in the private sector; with the second, we compare the average annual productivity that the subsidy to each green job would have contributed to the economy had it not been consumed in such a way, with the average productivity of labor in the private sector that allows workers to remain employed.

I. Stock of capital per worker

The total amount of invested and promised money to guarantee the viability of renewable energy in Spain is as high as 28,671 million Euros, and, if we include the non-subsidized investment, up to 50,200 employees have been put to work.

This forcible loss of resources incurred by renewable energy programs must be compared with the average resources per worker allocated in the private sector. The parameter that most closely approximates it is the average stock of capital per worker, whose mean between 1995 and 2005 in Spain was 259,143 Euros.

Therefore, for every green job that is attempted to be created, there is a 2.2 destruction of the resources that on average the private sector employs per worker

$$\frac{Subdidy\_to\_renewables\_per\_wor\ker}{Average\_capital\_per\_wor\ker} = \frac{571{,}138}{259{,}143} = 2.2$$

This is to say that for every renewable energy job that the State manages to finance, we can be confident that on average 2.2 jobs will be destroyed, to which we have to add those jobs that the non-subsidized investment would have created.

II. The annual productivity of the expense

In this section, we shall compare the average annual productivity that the green job subsidy would have contributed to the economy had it not been consumed in public financing, with the average productivity in the private sector that allows them to keep their job, the latter being ultimately the measure which justifies the creation or preservation of that job.

In order to obtain the annual public consumption of resources devoted to renewable energy we calculate the average annuity value during the next 25 years of subsidies. Now, what should be the rate at which we discount the annuities? In a private enterprise, the adequate rate would be the ROA (return on assets) because this is the rate of additional return that we would have obtained over a year if we had allocated, in the private sector, the annual cost of renewables.

For an entire economy, the closest thing we have to an ROA is the relationship between the annual income of capital and the stock of capital in the economy, that is, a ratio of the annual return on that stock of capital.

In Spain, annual capital profitability has slowed in recent years and thus we will take the lowest rate available: 8.53% in 2005.[56] With this discount, the average annuity for the end of 2008 is €55,946 per worker.

[56] Own elaboration from National Accounting figures published by National Statistics Institute (INE) and the BBVA Research Foundation.

This figure must be compared with the annual average productivity per worker in the rest of the economy. We can obtain this data by dividing the total income of labor in the economy by the number of workers. Thus, the average productivity per worker, between 2003 and 2007, was 25,332 Euros[57].

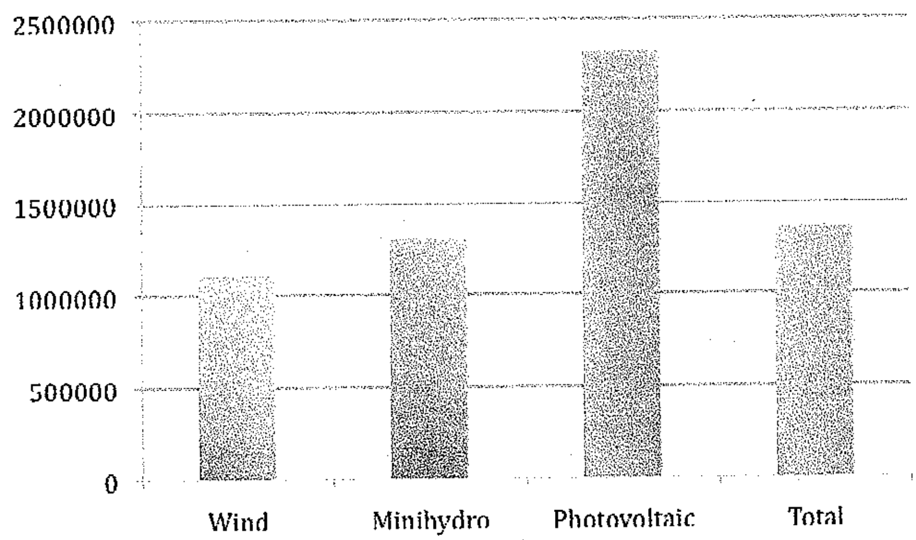
Thus, on average, the subsidized green job destroys the resources required to have created 2.2 jobs in the economy.

$$\frac{Annual\_subsidy\_to\_renewables\_per\_worker}{Average\_productivity\_per\_worker} = \frac{55{,}946}{25{,}332} = 2.2$$

Consequently, through the use of both methods we have reached a similar conclusion: for every green job, we can be highly confident that 2.2 jobs are destroyed elsewhere in the economy, to which we have to add those jobs that the non-subsidized investment would have created.

With that said, not all forms of energy sources are equally destructive, given that, to remain competitive, not all of them require the same amount of subsidy per megawatt. Our calculations, charted, reveal the following:

Figure 9.- Subsidy per MW (in €)



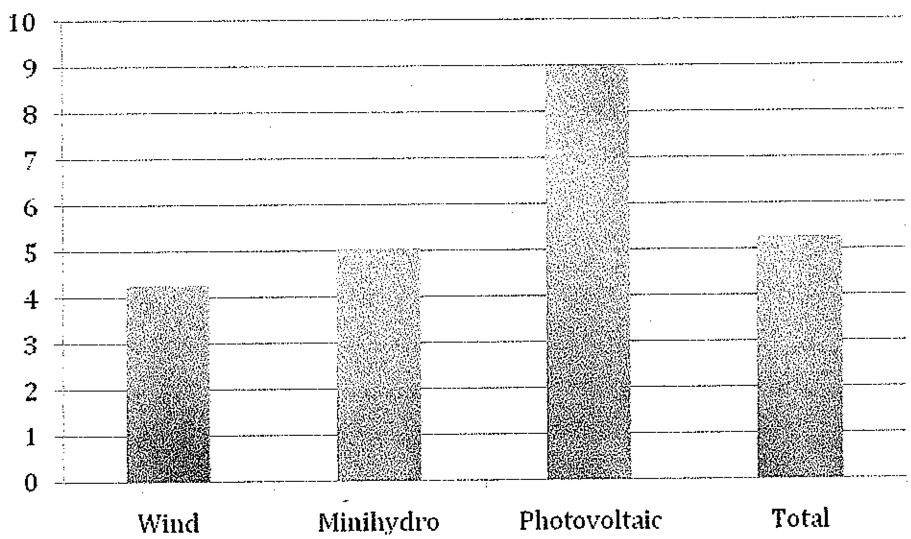
Source: Own elaboration.

We see that solar energy is significantly less competitive given that it requires more than twice the amount production of subsidy per megawatt compared to wind energy. By putting the per megawatt subsidy data in relation to the mean amount of capital resources, we obtain the number of jobs lost as a result of each kind of subsidized renewable energy source.

[57] Cuentas Nacionales, INE.

We achieve an identical result by relating the present value of an annuity of the sum of the committed amount with the annual productivity of labor:

Figure 10.- Employment destroyed per installed megawatt



Source: Own elaboration.

As we can see in figure 10, each renewable megawatt installed, on average (given Spain's breakdown of individual source contributions), destroys 5.28 jobs, compared with the 4.27 jobs destroyed per megawatt of wind energy, the 5.05 jobs destroyed per megawatt of mini-hydro and the 8.99 destroyed per megawatt of photovoltaic installed capacity as a result of "green jobs" mandates, subsidies and related regimes.

This result is important, since although solar energy may on paper appear to employ many workers (essentially in the plant's construction), the reality is that for the plant to work, it requires consumption of great amounts of capital that would have instead created many more jobs in other parts of the economy. Inversely, wind power, while still noxious in its economic impact when coercively introduced through state intervention, wastes far fewer resources per megawatt of installed capacity and thus does not destroy as many jobs in the rest of the economy.

This case is similar to the one that French economist Frédéric Bastiat denounced in his famous "Petition by the candle-makers," in which he ridicules the intentions of protectionist entrepreneurs by comparing them to candle-makers clamoring for the state to crowd-out the sun, which was competing with them unfairly when providing light. In their opinion, if the sun was barred from providing light, numerous jobs would be created in the candle manufacturing industry. Obviously, this is not so: precisely by not being able to profit from the sun's light we would be wasting scarce resources in the production of candles instead of producing other goods and services that would increase our wealth.

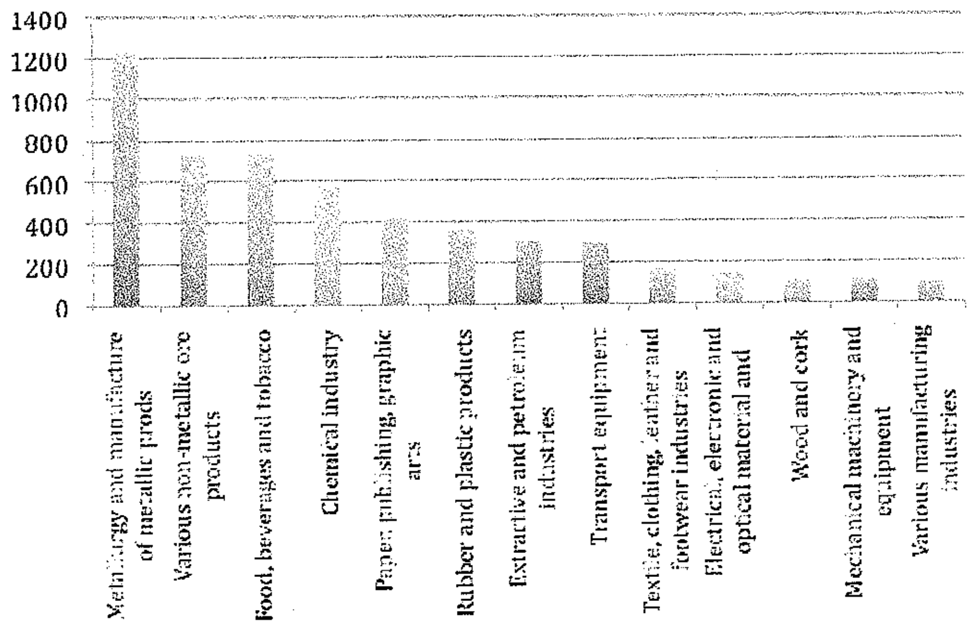
Finally, it is worth considering the distribution of the destroyed jobs across the economy. Obviously, the specific productive sectors affected will depend on how the government finances the subsidies to renewable energy. We can basically separate the

approaches intro three groups: increases in energy rates, increase in taxes or an increase in public debt.

The first method aims to correct the rate deficit, which in part is caused by the subsidies to the renewables, evidenced by a higher future electric cost. According to the National Energy Commission, the price of a comprehensive energy rate (paid by the end consumer) in Spain would have to be increased 31% to begin to repay the historic debt generated by this deficit.[58]

It is obvious that, if the rates were to increase by 31% — or by a lower percentage which, while it would not eliminate the deficit, it would reduce it—the energy intensive companies would suffer a very pronounced decline in their profitability and would have to reduce or eliminate operations in Spain. In our country, the sectors that consume the most energy are metallurgy, non-metallic mining and food processing, beverage and tobacco.

Figure 11.- Electricity consumption (in millions of €)



Source: INE (National Statistics Institute). From the Energy consumption survey (2007), table "Energy consumption by groups of activity and product consumed." (In this figure, the product shown is electricity).

From the groups above, it is worth highlighting that some of the most affected industries[59] would be producers of basic iron and steel products (in Spain, it consumed €470.77 million), basic chemical products (€382.13 million), plastics (€297.18 million), manufacture and first transformation of precious metals (€280.58 million) as well as producers of cement, lime and plaster (€202.22 million).

[58] See "Tarifas de acceso para 2009 y revisión de las tarifas integrales vigentes para el primer trimestre de 2009", CNE, November 7th 2008: http://www.cne.es/cne/doc/publicaciones/cne141_08.pdf

[59] Source: the most electricity-intensive industries pointed out here are taken from INE's Energy consumption survey (2007), table "Energy consumption by activity sectors and product consumed".

Unsurprisingly, the steel mills, the most electricity-intensive sector, have already been hurt by the high prices of electricity in Spain, exactly as the Acerinox example discussed below.

It is possible, of course, as it is indeed the case today in Spain, that the administration may try to prevent the most energy-intensive companies from leaving by bestowing upon them the privilege of paying a lower rate than the rest of the consumers pay. In Spain, it happens with the G4 rate, which is being taken advantage of by companies such as Arcelor Mittal, Asturiana de Zinc and Alcoa. But, as we have said, this privilege exacerbates the rate deficit, which, ultimately, must be financed through higher prices for the rest of non-privileged consumers or for the taxpayer.

And this leads us to the second possibility that we will mention to finance the rate deficit: an increase in taxation.

This method reduces the amount of income that consumers or businesses have available, reducing consumption and/or investment. For example, the average annuity payable to renewables is equivalent to 4.35% of all VAT collected, 3.45% of the household income tax, or 5.6% of the corporate income tax for 2007.[60] Regardless of whether the increase impacts consumption or investment more, the most affected sectors of the economy will be those with a greater pro-cyclical productions (such as automotive).

Finally, the subsidy to pay for "green jobs" or renewables could be financed by issuing public debt. This strategy poses a similar effect to the previous method but spread out over time (since it implies higher future taxes). However, debt has an additional effect: a restriction of present available credit that a business could use to refinance its debt or undertake new investments. Thus, employees of the most leveraged businesses or of investment projects that would need cheaper credit to be undertaken will suffer the costs of the renewables.

It is not possible to directly translate Spain's experience with similar exactitude or confidence, and claim that the U.S. should expect a loss of from 6.6 million to eleven million jobs as a direct consequence were the promise to create 3 to 5 million "green jobs" met (in addition to the jobs lost due to the opportunity cost of private capital employed in renewable energy), although the study clearly reveals that if President Obama would dedicate the massive resources needed to create those 3 to 5 million jobs, the U.S. should certainly expect its results to follow such a tendency.

At minimum, therefore, the study exposing the Spanish experience that President Obama cites as a model for the U.S. to replicate in quickly implementing "green jobs" programs serves as a note of caution that the reality far from what has typically been presented, and that such schemes offer considerable employment consequences and implications for emerging from the economic crisis.

[60] Own elaboration from Eurostat figures.

III. Spain's Self-inflicted Economic Wounds from "Green Jobs" Regimes

The late 90s already witnessed an energy leakage in Spain. As Jesús Lizcano Álvarez[61] put it, "Other substantial costs that can determine in some industries whether a relocation decision takes place can be energy costs, which –since they are higher in Spain than elsewhere nearby– along with other factor, have been crucial in cases such as the one of the Chemical company Hoeschst Ibérica, in its redirection of part of its investments abroad, or the case of Marcial Uchin, when deciding to build a steel mill in France, where energy costs are clearly competitive compared to Spain's."[62] Companies such as Sidenor have followed a similar path moving electric ovens to, e.g., France and other countries outside the EU, where energy prices are more competitive in the global market.

In April of 2004, the Mining-Metalurgy Federation of de CC.OO. strongly denounced the decision by the Grupo Celsa (parent company of Trefilerías Quijano, Global Steel Wire, Tycsa PSC, Tycsa Servicios, Laminaciones Arregui, Nervacero, Trefilerías Moreda, Celsa y Riviere) to close Trefilerías Quijano which, according to this union organization, was obeying a relocation policy as part of a plan to purchase a factory in Poland. However, the same union organization acknowledged the true culprit of these relocations when, in 2008, they warned that "we must take into account the profound impact that" an increase in energy costs "would have on the overall economy, and specifically, on industry and employment and families." The union perhaps would have obtained better results had they protested the European energy policy responsible for the loss of competitiveness in this sector, which has been zealously put into practice by the Spanish government.

Towards the end of 2006, UNESID (Unión de Empresas Siderúrgicas) warned that the process of liberalizing the electric market would lead to a relocation of a good portion of this industry due to the loss of competitiveness caused by high energy costs in Spain due to an energy policy closely linked to the promotion of renewable energy.

That same year, Ferroatlántica sounded the alarm. The company, the only producer of iron alloys in Spain, had an electric consumption of 2,300 Ghw in 2006 on Spanish soil and is the economic engine of the region of A Costa da Morte (Galicia). The continual increase in the cost of energy studied in this paper caused a change in the percentage of energy as a total cost of production in ferrosilicium from 37.1% in 1997 to 38.6% in 2000 and 43.2% in 2005. After years of installing efficient energy management measures, and increasing its productivity, in 2006 Ferroatlántica's factories had reached their productive capacity.

Because of that reality, the increases in energy prices had caused Ferroatlántica to lose competitiveness. The closing of the plants and their relocation to other countries such

[61] Professor of Accounting and Financial Economics at Universidad Autónoma de Madrid.
[62] Jesús Lizcano Ávarez. "Nuevas estrategias de contabilidad de gestión en las empresas multinacionales", Boletín AECA (Número Especial Congreso Sevilla), September 1995.

3 continents (and 4 soon), is that of the world's second-largest manufacturer of stainless steel, Acerinox.

Acerinox has already reduced or avoided extending its presence in Spain due to the high energy costs. Victoriano Muñoz, who led that company for 37 years, warned of the dangers of an electricity market distorted by such interventions in Spain as it would impose higher energy costs for industry. In April of 2002 he explained that the price of electricity for consumers had increased by 10.6% since the beginning of the decade, not to mention the related dozens of interruptions in the provision of that service.

A year later, the president of this leading stainless steel producer explained that in spite of good management and profits, important doubts had been cast about the company's operations as a result of the Kyoto agenda – a key part of which is a similar "green jobs" push – leading to possible relocation due to higher energy costs to nations that do not impose such regimes.

Consequently, when in 2004 Acerinox decided to increase the size and capacity of its operations it did so at plants in Kentucky (USA) and Columbia (South Africa), deciding to freeze its expansion plans in Spain, it cited the energy cost factor as influential. Consequently, green energy was to blame for the export of growth, meaning the transfer of hundreds of jobs from Spain to the USA and to South Africa.

In his last press appearance as CEO of Acerinox in July of 2008, Muñoz expressed regret and concern over the loss of competitiveness in the Spanish industry, which he blamed primarily on the continuous increase in energy prices. "We are going to have the highest prices in Europe," he said during his farewell, in which he once again urged removal of the barriers to construct nuclear plants as a way to achieve the Kyoto objectives, instead of the emphasis on renewable energy regimes that increase the price of electricity but not its reliability.

That final meeting with the press took place after Muñoz's last general shareholder meeting as president of Acerinox. In his remarks, he spoke of the loss of competitiveness in the Spanish industry due to a new 9.2% rise in actual cost per Kwh in 2006, the latest of many previous increases. However, this businessman, famous for his entrepreneurial spirit, commented that "we are afraid that the worst is yet to come," because, beyond the changes in regulated rates, "the continuous reduction of the hydroelectric and nuclear energy production share of the total Spanish electrical system."

Victoriano Muñoz associated Spain's ever-higher energy prices with the "green energy" policies enacted as a result of the Kyoto Protocol, even more than the "cap-and-trade" policy also adopted under Kyoto. Indeed, he explained that, although cap-and-trade had not yet directly harmed their bottom line, "indirectly, it affects [operations] very negatively through higher energy cost,"[63] That is, cap-and-trade's impact was first felt in

[63] Mr. Muñoz statements at Acerinox's annual reports and speeches at the General Shareholder Meetings (2002-2007) are downloadable at www.acerinox.es. His last press conference, that can be found at the following link: http://www.eleconomista.es/empresas-

AMERICAN INNOVATION:
MANUFACTURING LOW CARBON TECHNOLOGIES IN THE MIDWEST

THE °CLIMATE GROUP

Frederick A. and Barbara M. Erb Institute
for Global Sustainable Enterprise

JANUARY 2010

Report by
The Climate Group

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Project Director
Allison Hannon, Midwest Regional Manager, The Climate Group

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THE °CLIMATE GROUP

Frederick A. and Barbara M. Erb Institute
For Global Sustainable Enterprise
University of Michigan

HSBC Climate Partnership

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FOREWORD

Over the past few years, there has been a shift in the debate on climate change in the United States. The discussion has evolved from one focused on science to one focused on economics - specifically on the relative costs and benefits that will arise from a new comprehensive climate change and energy policy.

In this new debate, a major concern has been uncertainty about the impact climate and energy policies will have on the Midwest manufacturing sector. On the cost side, manufacturers will face increased energy and resource prices, which result in higher production costs. The higher cost could result in a decrease in output from both a decrease in consumption and a shift of production overseas. On the benefit side, manufacturers will have the opportunity to produce new, low-carbon technologies, as global demand for these goods increases.

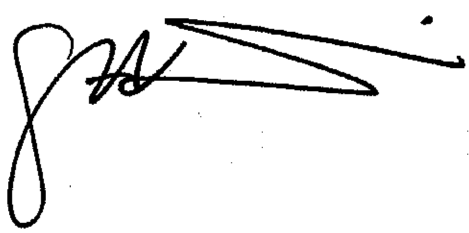
Credible data on the costs and benefits that climate policies will have on US manufacturing has been lacking in the past, making it difficult for manufacturers and policymakers to assess the total impact on their industries and regions.

On the cost side, a clearer picture has recently emerged. In 2009, The Pew Center on Global Climate Change and Resources for the Future released a report quantifying the impact that a $15 price on carbon would have on the competitiveness of specific US manufacturing sectors. The findings suggest that these impacts will be both "modest" and "manageable," with an average production decline of 1.3 percent across US manufacturing and "no statistically discernable" effect on employment for the manufacturing sector as a whole[1].

These findings are consistent with the impact that the American Clean Energy and Security Act of 2009 (ACES) would have on US manufacturing. The U.S. Environmental Protection Agency (EPA) estimated that a $16 price on carbon would lead to a production decline of .7 percent across US manufacturing by 2020 – with an increase in production of .04 percent in 2015 if a "rebate" program, which provides compensation to energy-intensive, trade-sensitive industries, is implemented.[2]

With this study, The Climate Group and The University of Michigan aim to shed light on the benefits side of climate policy, by quantifying expected growth in new, low-carbon manufacturing sectors, with climate and energy policies in place. Our findings show that the potential for growth in low-carbon manufacturing sectors in the Midwest is significant, with climate and energy policy creating additional market revenues of up to **$12.3 billion**, additional tax revenues of up to **$812 million** and up to **104,640** new jobs from only three low-carbon technology markets by 2015.

We take an in depth look into the wind turbine component, hybrid powertrain, and advanced battery markets in the Midwest, to provide an idea of the scope of the economic benefits that could result from comprehensive climate and energy policy. More research is needed to complete the picture. We hope this report can mark the start of that important task.



Amy Davidsen, US Executive Director, The Climate Group

Support for the Report

"Good government policy like renewable portfolio standards, which we passed in 2006, are creating family-supporting jobs in our state. This report shows in detail the enormous opportunity that Wisconsin – and the rest of the Midwest – stands to gain by taking the next step. We can stick our heads in the sand and let others seize that opportunity, or we can push forward and create jobs, grow our manufacturing base and leave a better world for our children and grandchildren."

Jim Doyle, Governor of Wisconsin

"The climate and our economy need help urgently. This timely report documents the huge boost we can give our economy if we adopt strategies to accelerate investment in the low-carbon technologies that will rejuvenate the industrial Midwest, put our people back to work and ensure the Midwest remains globally competitive."

Pat Quinn, Governor of Illinois

"The Climate Group's latest publication, American Innovation Manufacturing Low Carbon Technologies in the Midwest provides clear, solid job and revenue numbers for low carbon manufacturing in the Midwest. The report is a validation that in reducing greenhouse gas emissions, the opportunities are commensurate with the challenges."

Stanley "Skip" Pruss,
Chief Energy Officer and Director of the Department of Energy, Labor & Economic Growth, State of Michigan

"20th century innovations gave America a standard of living unimaginable a century before. In this new century, the industries that will thrive are those that are able to make that standard of living sustainable – by using renewable resources, and ones that do not contaminate our air, water and threaten our climate. As demand shifts from oil-burning cars to ones powered by renewably generated electricity, the American Midwest can develop the components for that supply chain: the turbines to capture the wind electricity for those cars, and the batteries to store that electricity. The findings in this report show that this kind of Midwest leadership is indeed possible. Just as the region thrived in the 20th century, with a proper adjustment to orient in line with global trends, it will thrive again in this century."

Mike Granoff, Head of Oil Independence Policies, Better Place

"With debate over the implications of prospective climate change regulation hotter than ever in the U.S., American Innovation: Manufacturing Low Carbon Technologies in the Midwest offers timely insight into some of the ways well-crafted policy responses can spur greentech innovation and generate economic opportunity."

William L. Thomas, Counsel, Skadden, Arps, Slate, Meagher & Flom LLP

EXECUTIVE SUMMARY

For too long, the overwhelming body of research related to climate policy has focused exclusively on the costs associated with taking action. And when research has been conducted about the benefits, the findings have often been too vast to easily understand and deconstruct. This report therefore aims to answer the following question:

WHAT IS THE ECONOMIC OPPORTUNITY FOR MANUFACTURING SELECTED LOW-CARBON TECHNOLOGIES IN THE MIDWEST?

To answer this question, we estimate the economic benefits associated with growth in three low-carbon technology markets: wind turbine components, hybrid powertrains and advanced batteries.

We estimate these benefits in two different scenarios.

- The "policy scenario" assumes that three climate and energy policies are in place: a "green" stimulus program; a $17 price on carbon, resulting from a cap on US emissions; and a national renewable electricity standard (RES) of 20% by 2020.

  For wind turbine components, we consider a "high" and "low" policy scenario to account for differences in how policy might affect US wind capacity. For hybrid powertrains, we only consider one policy scenario, due to consistency in projections of the share of hybrids in total US vehicle sales. For advanced batteries, we consider a "high" and "low" policy scenario to account for differences in the share of the advanced battery market that will be supplied by US manufacturers.

- The "no policy" scenario assumes that these three climate and energy policies are not in place.

The findings in this report should be considered in light of its narrow scope.

This report does not measure the net economic impact of climate and energy policies, in that we do not look at the costs associated with these policies. The revenues and jobs we found in low-carbon sectors do not take into consideration revenues and jobs lost in other sectors. More research is therefore needed to ascertain a truly complete picture.

We also do not consider all of the economic benefits of climate and energy policies, which include substantial energy efficiency savings, new jobs created outside of the manufacturing sector, benefits from the manufacture of hundreds of additional low-carbon technologies not examined in this report, and opportunities to export these low carbon technologies to other countries.

Instead, we take a deep look into one part of the potential benefits: the increased manufacture of three low-carbon technologies in the Midwest.

Low Carbon Technologies in the Midwest

Primary Metals	Chemicals	
Energy-efficient appliances	Amines for carbon capture and storage (CCS)	
Energy-efficient HVAC and building systems	Electrolytes for advanced batteries	
Public transportation systems	Energy-efficient building insulation	
Wind turbine components	Enzymes for increasing the energy efficiency of industrial processes	
	Photovoltaic (PV) solar cells	
Machinery Production	**Automotive**	
Biomass boilers	**Advanced batteries**	Diesel particulate filters
Combined heat and power systems	**Hybrid powertrains**	Lightweight vehicles

Of the 250 low-carbon technologies identified by McKinsey & Company, we look at 3 of the 15 in which the Midwest has a competitive advantage.

We estimate the benefits of manufacturing low-carbon technologies for only the Midwest region, defined as Illinois, Indiana, Michigan, Ohio, and Wisconsin, and we do so only until 2015.

Our limited scope enables us to take sector specific factors into consideration, and not to make too many assumptions about the future, which we feel leads to a more accurate estimate than would otherwise be possible.

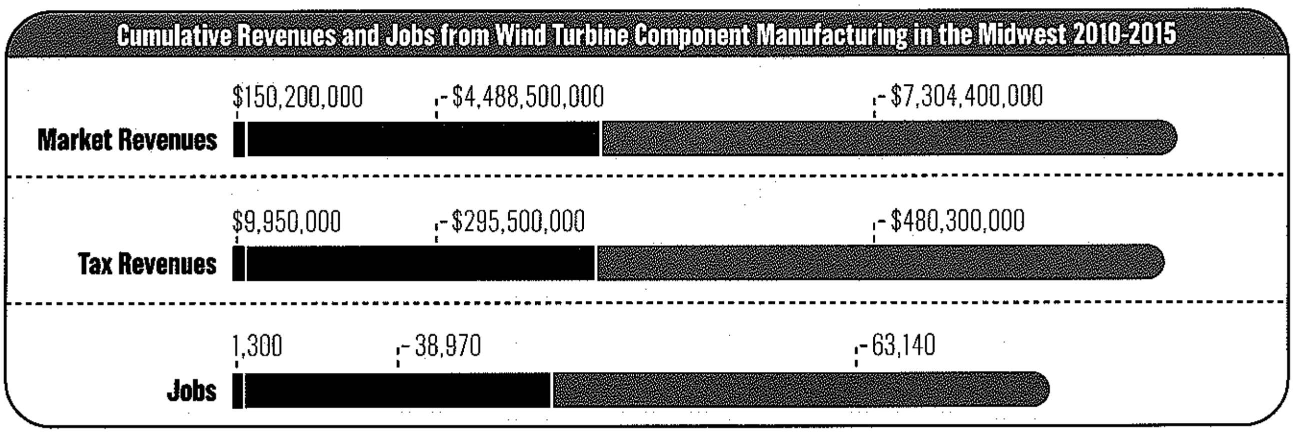
The end result provides a realistic answer to the question we set out to address.

Wind Turbine Components

Our case study on wind turbine components found that the three climate and energy policies would lead to significant new market revenues, state and local tax revenues and jobs.

In the "policy-low capacity" scenario, where policies would increase US wind capacity to 65.7 GW, we estimate $4.3 billion in additional market revenues, $286 million in additional tax revenues and more than 37,600 new jobs in the Midwest by 2015. ("Additional" revenues and jobs are in comparison to the "no policy" scenario.)

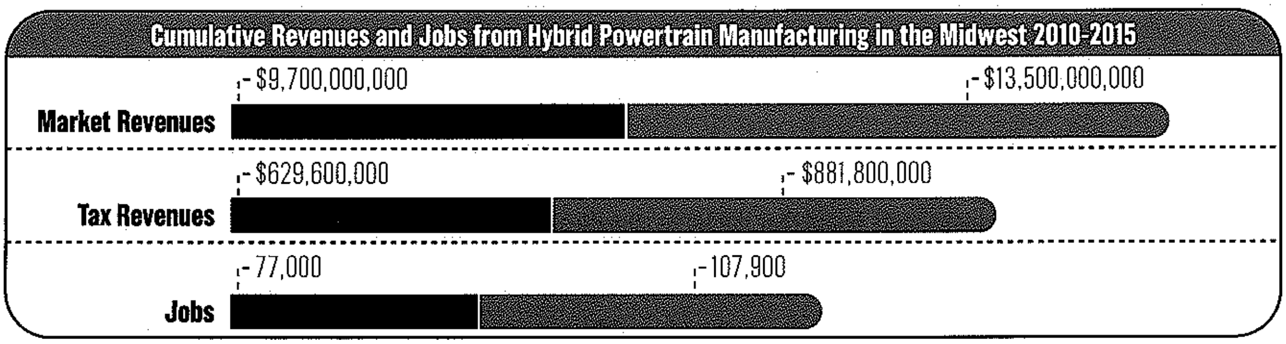
In the "policy-high capacity" scenario, where policies would increase US wind capacity to 90 GW, we estimate $7.1 billion in additional market revenues, $470 million in additional tax revenues and more than 61,800 new jobs in the Midwest by 2015.



	No Policy (28.6 GW)	Policy-Low (65.7 GW)	Policy-High (90 GW)
Market Revenues	$150,200,000	$4,488,500,000	$7,304,400,000
Tax Revenues	$9,950,000	$295,500,000	$480,300,000
Jobs	1,300	38,970	63,140

Hybrid Powertrains

Our case study on hybrid powertrains found that the three climate and energy policies would lead to $3.8 billion in additional market revenues, $252 million in additional tax revenues and 30,900 new jobs in the Midwest by 2015.



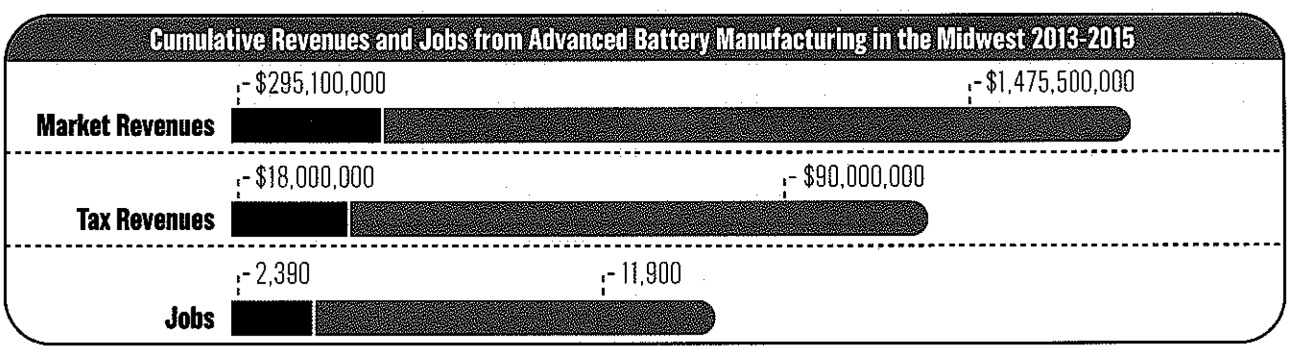
	No Policy	Policy
Market Revenues	$9,700,000,000	$13,500,000,000
Tax Revenues	$629,600,000	$881,800,000
Jobs	77,000	107,900

Advanced Batteries

Our case study on advanced batteries found that the three climate and energy policies would lead to modest new market revenues, state and local tax revenues and jobs.

In the "policy-low share" scenario, where the US supplies 10% of the domestic advanced battery market, we estimate $295 million in additional market revenues, $18 million in additional tax revenues and more than 2,300 new jobs in the Midwest by 2015.

In the "policy-high share" scenario, where the US supplies 50% of the domestic advanced battery market, we estimate $1.4 billion in additional market revenues, $90 million in additional tax revenues and 11,900 new jobs in the Midwest by 2015.



	No Policy (US supplies less than 1% of total demand)*	Policy-Low Share (US supplies 10% of total demand)	Policy-High Share (US supplies 50% of total demand)
Market Revenues	NA	$295,100,000	$1,475,500,000
Tax Revenues	NA	$18,000,000	$90,000,000
Jobs	NA	2,390	11,900

* Because the US currently supplies less than one percent of the global advanced battery market, the size of the domestic advanced battery market in the "no policy" scenario is assumed to be zero.

In total, the three climate and energy policies would lead to additional market revenues of up to $12.3 billion, additional tax revenues of up to $812 million and up to 104,640 new jobs from the wind turbine component, hybrid powertrain and advanced battery manufacturing sectors in the Midwest by 2015.

OVERVIEW

State of the Midwest Manufacturing Sector

Manufacturing is the backbone of the Midwest economy. Four sectors are of primary importance to the Midwest, according to the most recent data from the Chicago Federal Reserve Midwest Manufacturing Index (CFMMI), which estimates manufacturing output in the Seventh Federal Reserve District. These four sectors are (1) primary metals, (2) chemicals, (3) machinery production, and (4) the automotive sector[1].

Manufacturing in the Midwest continues to employ a far higher percentage of the population than other regions of the United States, particularly in these core sectors.

The manufacturing industry was still reeling from the 2001 economic downturn when the current recession hit, so even though the region has the nation's highest concentration of manufacturing jobs, total employment in the region has yet to return to pre-2001 levels[2]. Much of the Midwest's manufacturing base has been lost to competition, both foreign and domestic. Michigan alone lost 800,000 jobs from 2000-2010, totaling 18 percent of its workforce[3].

In light of this decline, many have taken note of how other countries have increased manufacturing production in emerging sectors.

For example, Germany has had success growing its renewable energy manufacturing sector. With a manufacturing base very similar to that of the US, a price on carbon emissions and a robust feed-in tariff in place, the German renewable energy sector has grown by 330% over the last ten years, employing 280,000 people. By 2020, Germany is expected to employ 500,000 people in the renewable energy sector, more than the auto industry[5]. In a country that is home to BMW, Porsche, Mercedes and Volkswagen, this is a significant shift.

"IN GERMANY THEY CREATED 280,000 JOBS **BY CHANGING THE INCENTIVES FOR THE USE OF WIND AND SOLAR.** WE OUGHT TO BE DOING THE SAME THING IN MICHIGAN."

– GOVERNOR JENNIFER M. GRANHOLM, STATE OF MICHIGAN[4]

This growth was enabled by increased global demand for clean energy and energy efficient technologies. HSBC estimates that the global market for climate change products and services was greater than $300 billion in 2007, more than the revenue for the entire electrical equipment industry or the communications equipment industry[6].

As Midwest policymakers look for ways to replace lost manufacturing jobs, information on the potential for job creation in the low-carbon manufacturing sector is needed.

This report aims to answer the question:

WHAT IS THE ECONOMIC OPPORTUNITY
FOR MANUFACTURING SELECTED LOW-CARBON TECHNOLOGIES IN THE MIDWEST?

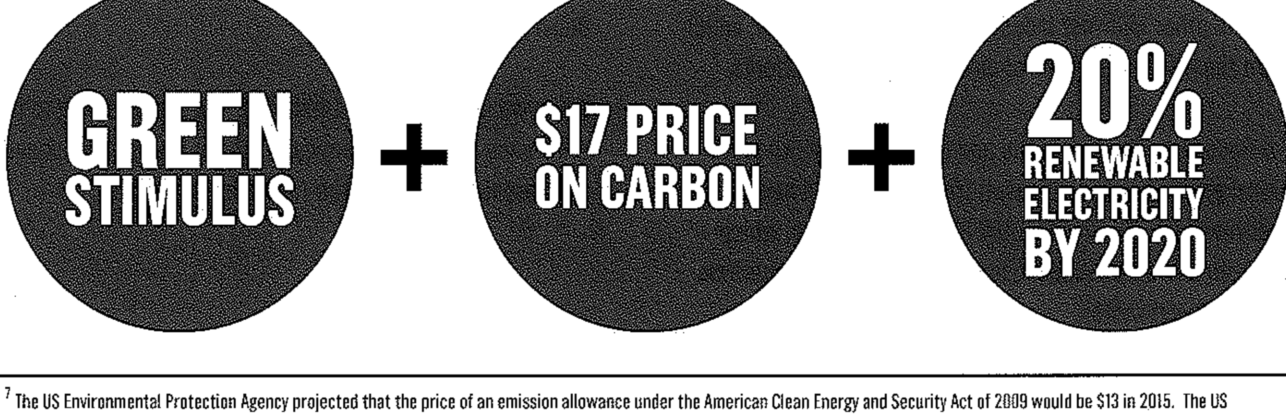
To answer this question, we estimate the **benefits** associated with three **low-carbon technology** markets in the **Midwest**, in two different **scenarios**: one with climate and energy policies in place and one without.

"Policy" Scenario

The first scenario is the "policy" scenario, with three climate and energy policies in place. These policies include:

1. A "green" economic stimulus program
2. A price on carbon of $17 per ton of carbon dioxide equivalent (CO_2e) in 2015 resulting from a cap on US emissions, and
3. A national renewable electricity standard (RES) of 20% by 2020.

The "green" economic stimulus we modeled is consistent with the American Reinvestment and Recovery Act of 2009 (ARRA). The $17 price on carbon in 2015 and the renewable electricity standard of 20% by 2020 are consistent with the American Clean Energy and Security Act of 2009 (ACES) [7]. For the RES, this means that we adjusted for the fact that 5% of the standard can be met though energy-efficiency improvements while the remaining 15% must be met with renewable energy[8].



[7] The US Environmental Protection Agency projected that the price of an emission allowance under the American Clean Energy and Security Act of 2009 would be $13 in 2015. The US Congressional Budget Office projected that the price of an emission allowance would be $19 in 2015.

The three policies affect different low-carbon technologies in different ways. For example, the wind turbine component market is driven by all three policies, while the hybrid powertrain market and the nascent advanced battery market are driven primarily by the "green" economic stimulus program and the price on carbon, but not by the RES.

	"Green" stimulus	$17 price on carbon	20% national RES
Wind turbine components	X	X	X
Hybrid powertrains	X	X	
Advanced batteries	X	X	

"No Policy" Scenario

The second scenario is the "no policy" scenario, with none of these three climate and energy policies in place. The "no policy" scenario excludes the American Reinvestment and Recovery Act of 2009 (ARRA), which passed in February of 2009 - so it is not the same as the present day or "business as usual" scenario.

Benefits

The economic and fiscal benefits associated with these policies are measured using the following metrics:

1. Market Revenues: These are the additional revenues expected to result from growth in low-carbon manufacturing. Our definition of market revenues includes the amount of money that low-carbon industries spend to produce their technologies. It does not include indirect effects, which result from low-carbon industries and their employees purchasing more from other Midwest industries, or induced effects, which capture the multiplier effect of direct and indirect effects.

2. Tax Revenues: These are the additional revenues to state and local governments that result from taxes on all new market revenues. We also identify interstate effects, which result from low-carbon industries purchasing from industries in other Midwest states.

3. Job Creation: These are the new jobs created by growth in low-carbon manufacturing. We distinguish between direct jobs, which are created within the low-carbon sector, and indirect jobs, which are created outside the low-carbon sector - resulting from low-carbon industries buying more from other Midwest industries. Total jobs equal the sum of direct and indirect jobs.

Both market revenues and tax revenues are reported in 2009 dollars.

When we use the word "additional," we are referring to the difference between revenues or jobs in the "policy" scenario and revenues or jobs in the "no policy" scenario.

Midwest

For the purposes of this report, the "Midwest" refers to the states of Illinois, Indiana, Michigan, Ohio, and Wisconsin, defined by the US Census Bureau as the East North Central Census Region[9].

Low Carbon Technologies

Low-carbon technologies are technologies that help reduce greenhouse gas emissions, either by reducing fossil fuel based energy consumption, enabling the use of clean energy sources or capturing carbon emissions. Low-carbon technologies exist in a range of economic sectors. In this report, we focus on low carbon technologies within the four core Midwest manufacturing sectors: primary metals, chemicals, automobiles, and machinery.

Based on existing literature including "Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?" (McKinsey & Company), and "Manufacturing Climate Solutions" (Center on Globalization, Governance & Competitiveness), we identified low-carbon technologies within each of these sectors based on 2002 and 2006 US Census production data from industries classified at the six-digit level in the North American Industry Classification System (NAICS). Each technology was assigned to a specific NAICS code and data including the number of establishments, total revenues, annual payroll and number of employees were collected to estimate production and productivity indicators in the Midwest and the nation.[10&11]

Many of these technologies are associated with more than one manufacturing sector. For example, wind turbine components are associated with both primary metals and machinery. Advanced batteries are associated with both the automotive and chemicals sector. However, for the purpose of this report, we have classified each technology under a single economic sector.

Primary Metals	Chemicals	
Energy-efficient appliances	Amines for carbon capture and storage (CCS)	
Energy-efficient HVAC and building systems	Electrolytes for advanced batteries	
Public transportation systems	Energy-efficient building insulation	
Wind turbine components	Enzymes for increasing the energy efficiency of industrial processes	
	Photovoltaic (PV) solar cells	
Machinery Production	**Automotive**	
Biomass boilers	Advanced batteries	Diesel particulate filters
Combined heat and power systems	Hybrid powertrains	Lightweight vehicles

An analysis of the impact that climate and energy policies would have on all of these technologies would provide a near complete picture of the benefits to the Midwest manufacturing sector. To begin creating this picture, this study provides analysis of three of these technologies:

1. Wind turbine components (Primary Metals)
2. Hybrid powertrains (Automotive)
3. Advanced batteries (Automotive)

The case study technologies were chosen based on a number of criteria (see appendix) including availability of industry data and ability to define the market for the technology, which supported an analysis at this period of time.

As such, the case studies selected here do not represent a total picture of the benefits to the Midwest manufacturing sector from climate and energy policies. Instead, they are a proxy to help better understand the scope of the total benefits.

Format

Each case study begins with an overview of the primary economic sector to which the specific low-carbon technology is tied. It then provides relevant information on the market for the technology and describes the method used for calculating the impact that climate and energy policies would have on that market. It concludes with the economic findings for the technology in the "policy" and "no policy" scenarios - measured by market revenue, state and local tax revenues, and job creation.

Scope

The findings represented in this report should be considered in light of their narrow scope.

First, this report does not measure the net impact of climate and energy policies. We do not look at the costs associated with these policies, which result from increased energy prices and higher production costs. These costs are estimated by the US Environmental Protection Agency (EPA) and the US Congressional Budget Office (CBO), among others. Furthermore, the increases in market revenues, tax revenues and jobs that we found in the low-carbon sectors do not take into consideration revenues and jobs lost in other sectors.

We also do not consider all of the economic benefits of climate and energy policies, which include substantial energy efficiency savings, new jobs created outside the manufacturing sector, and opportunities to export low-carbon technologies to other countries.

Second, we do not consider the opportunity for all low-carbon technologies. In their report, "Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?" McKinsey & Company identifies 250 technologies that contribute to reducing emissions. In this report, we identify 15 of these technologies, which the Midwest has a clear competitive advantage in manufacturing. In order to consider as much sector specific detail as possible, the following case studies take an in-depth look at the opportunity for 3 of these 15 technologies.

Last, our regional, economic and temporal scope is also limited. We do not estimate the opportunity for the entire United States, but for only for the Midwest, defined here as the states of Illinois, Indiana, Michigan, Ohio, and Wisconsin - defined by the US Census Bureau as the East North Central Census Region. And we only estimate benefits over the next five years.

Our limited scope enabled us to take sector specific factors into consideration and not to make too many assumptions about the future, which we feel led to a more accurate estimate than would otherwise have been possible.

The end result provides a realistic answer to the question:

What is the economic opportunity for manufacturing selected low-carbon technologies in the Midwest?

CASE STUDY 1
WIND TURBINE COMPONENTS

CASE STUDY 1 WIND TURBINE COMPONENTS

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In the "policy-high capacity" scenario, where policies would increase US wind capacity to 90 GW, we estimate $7.1 billion in additional market revenues, $470 million in additional tax revenues and more than 61,800 new jobs in the Midwest by 2015.

Primary Metals Sector

Wind turbine components are primarily classified under the primary metals sector. The primary metals sector includes the manufacture of fabricated metal products; electrical and electronic machinery, equipment, and supplies; and transportation equipment. The metals include steel, iron, aluminum, copper, and specialty metals like titanium and molybdenum. Steel is the dominant primary metal manufactured in the United States, especially in the Midwest[1].

The US primary metals industry is made up of about 4,000 companies with combined annual sales of about $150 billion. Together, they employ about 444,000 Americans nationwide, including more than 80,000 in Indiana and Ohio[2]. Large companies include US Steel and Arcelor Mittal, Nucor (steel); Alcoa (aluminum); and Phelps Dodge (copper). Demand comes largely from manufacturers of automobiles, machinery, containers, and construction bars and beams. Profitability depends largely on volume, because of heavy fixed investment, and efficient operations.

Steel production in the Midwest has declined over the past year. Similar to many other manufacturing sectors around the world, steel output in the Midwest dropped 35.6% from its August 2008 level, as the global economic downturn took its toll[3].

The outlook for primary metals, especially steel, is directly tied to demand from downstream purchasers like automobiles and construction, as well as to production costs (labor, health-care coverage, energy needs) and productivity.

Emerging low carbon technologies that are downstream of the primary metals sector, like new public transportation systems, HVAC and building systems, energy efficient appliances, and wind turbine components, have the potential to create additional market demand.

Primary Metals	
Energy-efficient appliances	Public transportation systems
Energy-efficient HVAC and building systems	Wind turbine components

The Wind Turbine Component Market

THE MARKET FOR WIND TURBINE COMPONENTS IS ESPECIALLY WELL POSITIONED FOR GROWTH IN THE MIDWEST.

Wind energy is the fastest-growing renewable energy source in the US. In 2008, 42% of new power producing capacity brought online in the US was from wind. US wind capacity increased to 25.3 GW - equal to 1.25% of the nation's total energy generation[4]. The expansion added 8,400 domestic manufacturing jobs and 35,000 wind related jobs in total, bringing total US employment in this sector to 85,000[5].

Demand for wind turbine components comes mainly from large utilities and corporations with significant power needs. The market is concentrated. Twenty companies account for 83.6% of wind facility ownership, and four of these companies account for nearly 50% of total US capacity.

Wind turbines can be broken down into five major components: (1) rotor, (2) nacelle and machinery, (3) gearbox and drive train, (4) generator, and (5) tower. Half of the wind turbine components installed in the US are produced domestically. Market researchers anticipate that the United States - and specifically the Midwest - will capture an even larger share of this market going forward, if current production trends continue.[6]

Based on the distribution of existing wind turbine component factories, the Midwest currently has a competitive advantage in two of the five component categories. Roughly half of the nation's nacelle and machinery factories (17 out of 38), and more than a third of gearbox and drive train factories (13 out of 30) are located in the Midwest. Other components like turbine towers, for example, which are costly to transport, do not currently play a prominent role in the Midwest[7].

In 2008, eleven new factories related to wind turbine production opened in the United States, including one in Wisconsin and one in Michigan. Additionally, seven companies from related businesses entered the wind turbines market in Michigan and Ohio[8].

The Midwest's future in this sector will rely partly on factories shifting from traditional markets, such as automotive parts, to wind turbine components. The potential for this kind of conversion is illustrated by the fact that there are 7,299 factories in the Midwest that manufacture in the same industry classification code as wind turbine components (i.e. fabricated metal products; primary metals; computer and electronic products; plastic and rubber products; and electrical equipment, appliances and components)[9].

Explanation of the Economic Model and Method

This case study estimates the economic benefits associated with growth in the wind turbine component market in the Midwest, in two different scenarios: the "policy" scenario and the "no-policy" scenario.

The main difference between the two scenarios is the effect that climate and energy policies have on the amount of wind generated electric capacity in the US. Existing projections vary significantly on how large that effect will be. So, in addition to the "no policy" scenario, we consider two different policy scenarios - one with "low" and one with "high" projections of the amount of wind generated electric capacity in the US.

"No Policy" Scenario

In the "no policy" scenario (which does not include any of the three policies considered, including the stimulus) US wind capacity would increase to 28.6 GW by 2015. Projections of wind capacity in the "no policy" scenario are based on the US Energy Information Agency's (EIA) Annual Energy Outlook 2009, which projects 17.2% growth in wind capacity in the next decade, based on organic growth in the industry, state Renewable Electricity Standards,[10] and the extension of the Production Tax Credit (PTC) in the Energy Improvement and Extension Act of 2008 (EIEA)[11].

How do the three policies affect the wind turbine component market?

1) A "green" economic stimulus program: ARRA extends the Production Tax Credit (PTC) through 2012 and also allows renewable energy projects placed in service by the end of 2012, to choose an upfront Investment Tax Credit (ITC) or cash grant in lieu of the PTC.

2) A price on carbon of $17 per ton of CO2e resulting from a cap on US emissions: A price on carbon makes alternatives to wind energy more expensive, increasing demand for wind energy.

3) A national renewable energy standard of 20% by 2020: A renewable energy standard creates guaranteed demand for wind energy by requiring utilities to meet a certain percentage of their electricity generation from renewable sources.

[10] Four of the five states targeted in this study have RPSs: Illinois (25% by 2025), Michigan (10% by 2015), Ohio (12.5% by 2024), and Wisconsin (10% by 2015)

"Policy-Low Capacity" Scenario

In the "policy" scenario using "low" projections, US wind capacity would increase to 65.7 GW by 2015. These projections are based on analysis by the US Environmental Protection Agency that estimates how wind generated electricity capacity would be impacted by ARRA stimulus spending and the price on carbon and national RES included in ACES[12]. From here forward, we refer to this scenario as the "policy-low capacity" scenario.

"Policy-High Capacity" Scenario

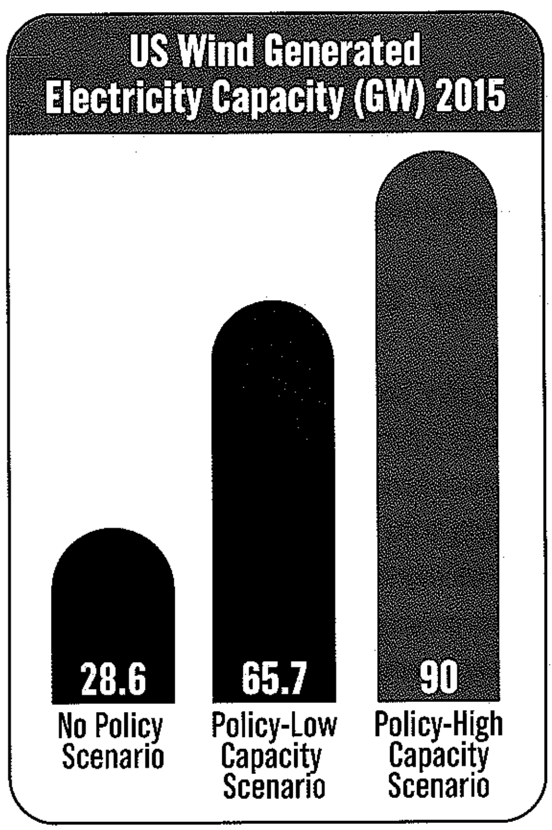
In the "policy" scenario using "high" projections, US wind capacity would increase to 90 GW by 2015. These projections are based on analysis by Emerging Energy Research (EER), which estimates how a national cap and trade system and a national RES (in addition to current state Renewable Portfolio Standards (RPS)) would impact wind generated electric capacity. From here forward, we refer to this scenario as the "policy-high capacity" scenario[13].

Increased demand for wind energy would lead directly to increased demand for wind turbine components. Primary metals-and machinery parts related manufacturers in the Midwest are well positioned to meet the demand for turbine components, particularly those making nacelle and machinery components, and gearboxes and drive trains[14].

National market revenues were estimated by multiplying expected US wind capacity by a capacity-weighted average turbine price of $1,360 per kilowatt - based on the US Department of Energy's (DOE) 2008 Wind Technologies Market Report[15].

Turbine revenues were then allocated across the supply chain based on the relative cost of producing each part. We used an initial allocation of 28% for blade production, 26% for tower production, and 46% for the remaining components[16]. Production in these three segments is then further divided to capture the effect of domestic versus overseas production and state versus state production, using US Department of Energy (DOE) data on factory locations[17].

Direct and indirect effects on market revenues, tax revenue and job creation were then estimated using a commercial input-output model (IMPLAN). This model is commonly used to estimate changes in economic output given a shift in demand for a specific product.



Additional Assumptions

Operating expenditures are omitted from impact calculations. The Midwest region, as defined in this report, only accounts for 1.5% of remaining national wind capacity in the country. Therefore, the operational costs of new wind power plants are omitted[18].

Plant locations and size remain constant. We assume that the distribution of plants within each state will remain constant. If the distribution were to change, this would alter the regional effects.

Access to the electrical grid. Realizing the full growth potential of this sector will depend on new wind energy plants and their ability to connect to a transmission network.

No local opposition to wind farms. A large amount of local opposition to wind farms would limit the pace of installation and therefore could limit demand in the manufacturing sector.

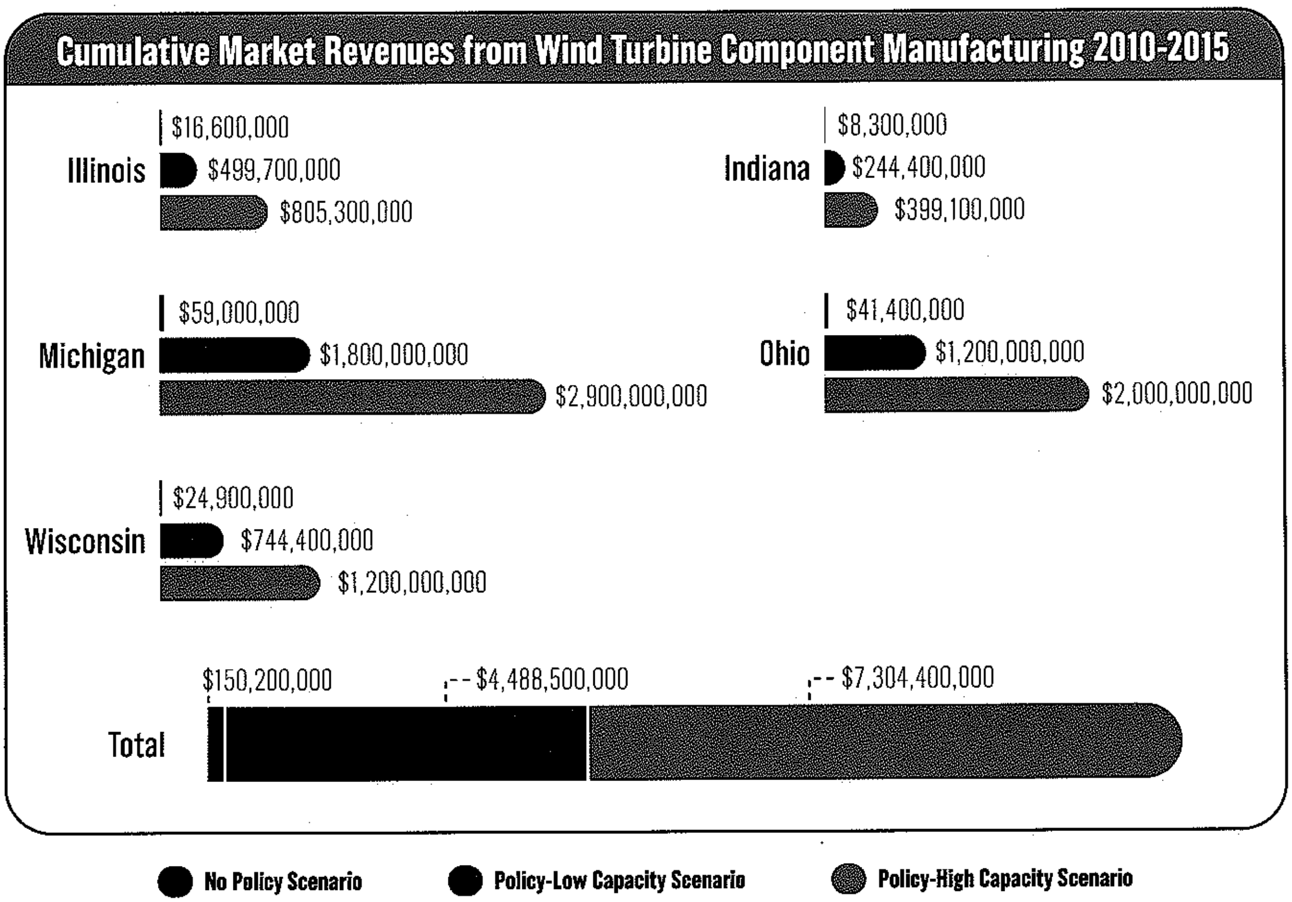
Availability of skilled labor. Production of wind turbines requires highly specialized labor, and the industry has already experienced shortages of skilled labor.

Findings

Market Revenues

Compared to the "no-policy" scenario, the "policy-low capacity" scenario would lead to $4.3 billion more in market revenues in the Midwest, while the "policy-high capacity" scenario would lead to more than $7 billion more in market revenues from 2010-2015.

Michigan would experience more than $740 million in additional market revenues in the "policy-low capacity" scenario and more than $2.8 billion in the "policy-high capacity" scenario over the same period.

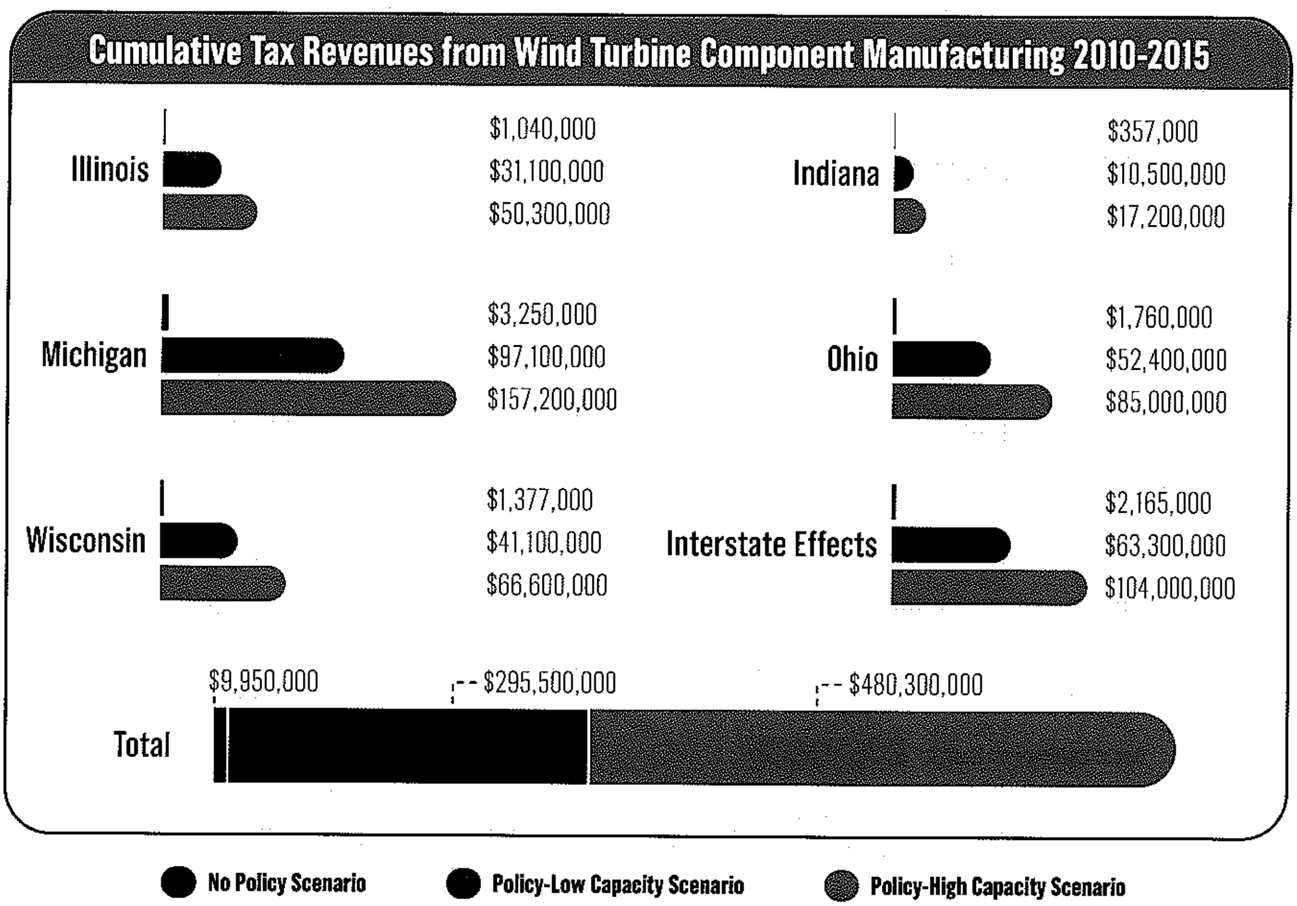


Tax Revenues

Compared to the "no-policy" scenario, the "policy-low capacity" scenario would lead to more than $286 million in additional tax revenues in the Midwest, while the "policy-high capacity" scenario would lead to more than $470 million in increased tax revenues from 2010-2015.

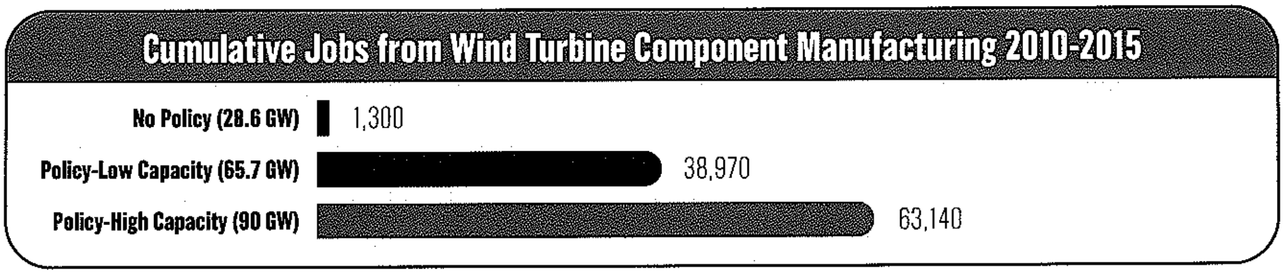
In Ohio, this translates to about $50 million more in tax revenues under the "policy-low capacity" scenario and more than $83 million under the "policy-high capacity" scenario.

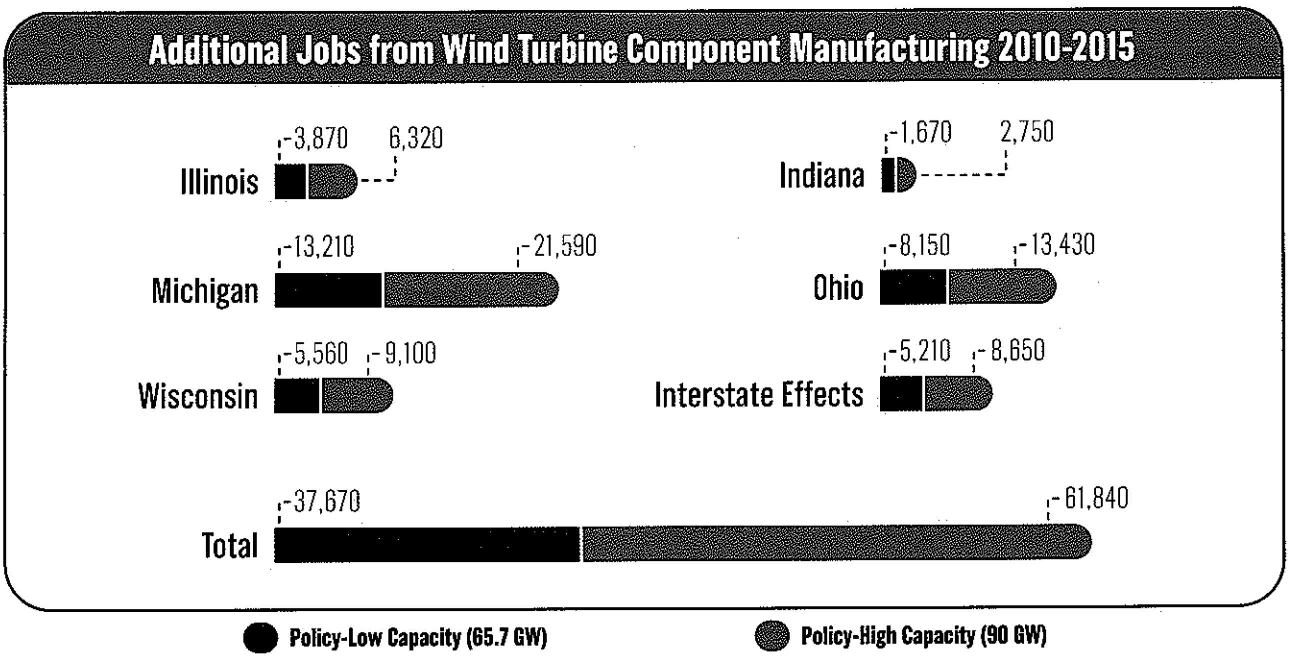
In Michigan, the "policy-low capacity" scenario yields almost $94 million in additional tax revenues.

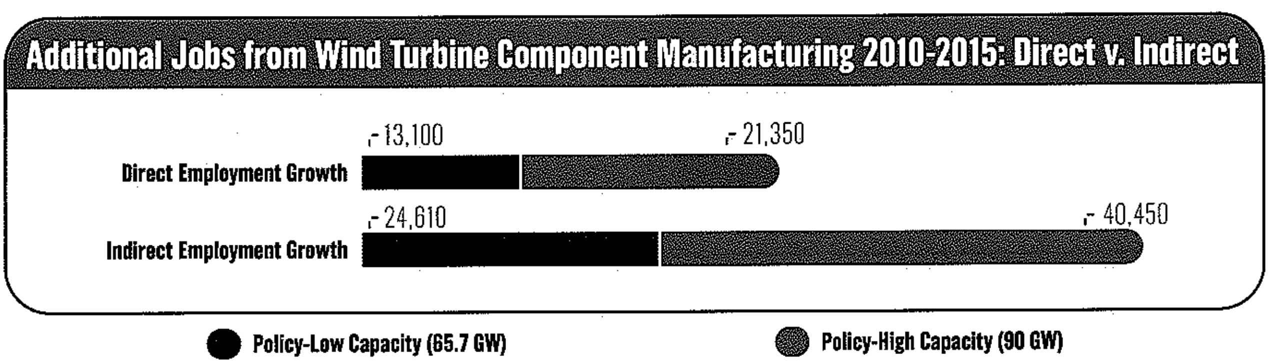


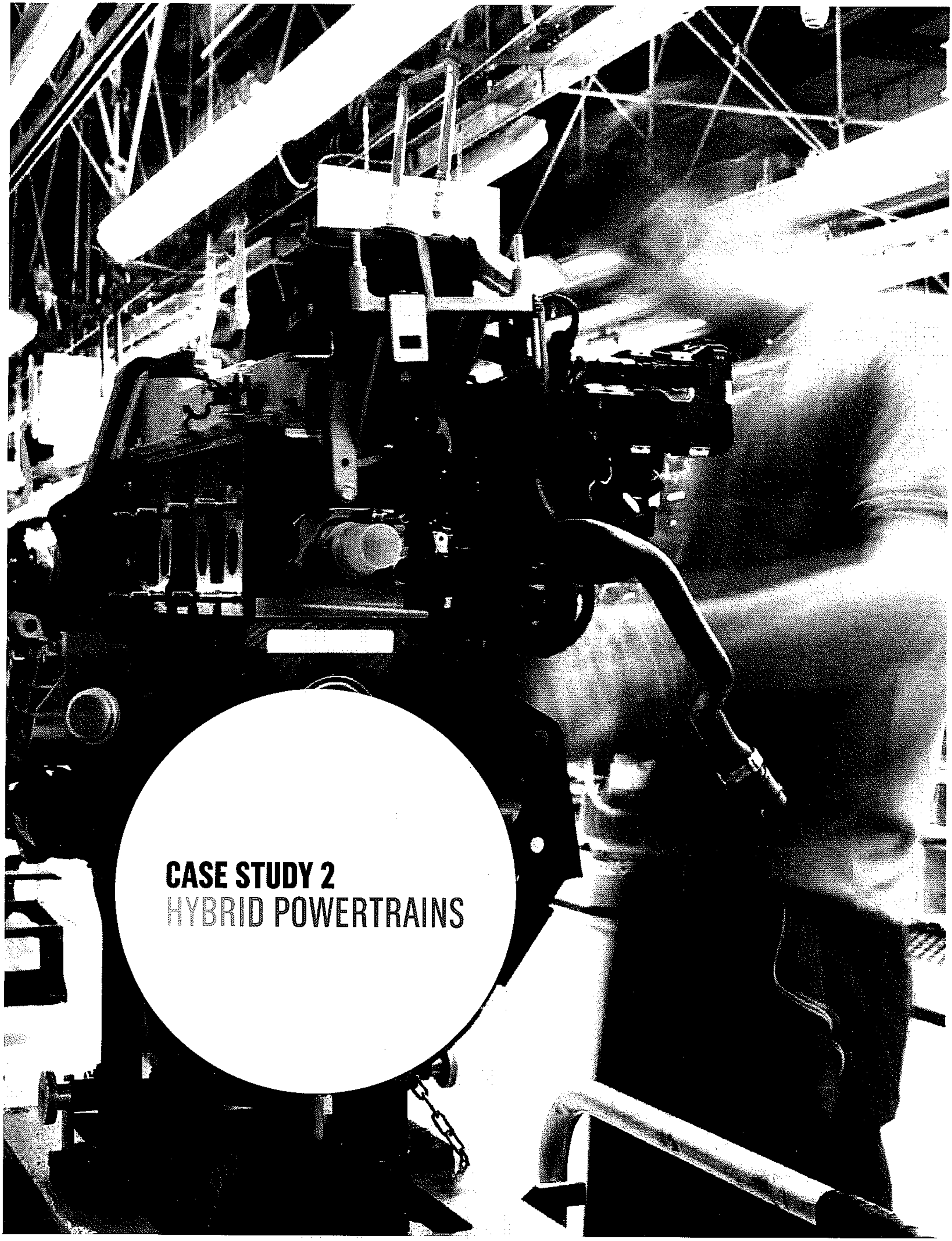
Job Creation

Throughout the Midwest, the "policy-low capacity" scenario would generate about 13,000 more direct jobs and about 25,000 more indirect jobs than the "no policy" scenario. In Michigan, which employs the most people in this sector, the "policy-low capacity" scenario would create about 5,400 more direct jobs and 13,200 more indirect jobs.









CASE STUDY 2
HYBRID POWERTRAINS

CASE STUDY 2 HYBRID POWERTRAINS

Our case study on hybrid powertrains found that the three climate and energy policies would lead to $3.8 billion in additional market revenues, $252 million in additional tax revenues and 30,900 new jobs in the Midwest by 2015.

Automotive Sector

Hybrid powertrains are classified under the automotive sector.

The US vehicle manufacturing industry includes three major companies with Ford, General Motors and Chrysler holding 47% of domestic market share in mid 2008[1]. In 2008, the "Detroit Three" had combined annual sales of about $360 billion and employed about 520,000 Americans. All three companies are based in the Midwest, with 11 of their 24 assembly plants located there[2].

Motor vehicle manufacturing employment in the US has declined more than 50 percent from 1999 to August 2009[3].

A number of concerns, including volatile gas prices, climate change and dependence on foreign oil, have caused a shift in consumer demand towards more energy efficient vehicles. A study by Harvard University found that 27% of consumer hybrid purchases from 2002-2006 were motivated by high gasoline prices[4].

The hybrid powertrain market has historically been dominated by Toyota, with Honda and Ford capturing smaller market shares. In 2008, Toyota held 77% of the US hybrid vehicle market[5].

Several low carbon technologies are expected to capture an increasingly large market share in the vehicle manufacturing industry. This "basket" of technologies includes advanced batteries, diesel particulate filters, hybrid powertrains, and lightweight vehicles.

While all of these technologies represent potential opportunities for Midwest manufacturing, the markets for hybrid electric vehicles (HEVs) and advanced batteries are especially well positioned for growth in the near future[6].

Automotive	
Advanced batteries	Hybrid powertrains
Diesel particulate filters	Lightweight vehicles

[6] While plug-in hybrid electric vehicles (PHEVs) and pure electric vehicles (EVs) also have a promising forecast, they are not considered here, because of the lack of reliable forecasts.

The Hybrid Powertrain Market

THE MIDWEST HAS A COMPETITIVE ADVANTAGE IN ALL FOUR POWERTRAIN COMPONENTS.

The hybrid powertrain market is experiencing a significant increase in demand. Annual growth of hybrid powertrain sales is expected to average 38% through 2012[7]. To respond to this increase in demand, vehicle manufacturers such as General Motors and Toyota, have announced the introduction of next-generation plug-in hybrids as early as 2010[8].

Hybrid powertrains consist of four major components: (1) gasoline engine, (2) electrical equipment, (3) battery, and (4) drivetrain. Together, they account for 55% of an HEV vehicle's cost. The Midwest has a competitive advantage in all four powertrain components[9&10].

How do Hybrid Powertrains Differ from Conventional Powertrains?

In a hybrid powertrain, the electric motor provides power to assist the engine in accelerating, passing, or hill climbing, allowing for a smaller gasoline engine. In some hybrids, the motor provides sole power for low-speed driving conditions, where internal combustion engines are least efficient. As a result, hybrids have greater fuel efficiency and reduced emissions[14].

Gasoline engine & parts

About 30 percent of US engine, fuel delivery, exhaust & emissions, and inverter manufacturers are located in the Midwest, generally near vehicle manufacturers, which allows for joint research and development and reduced delivery lead times[11].

Electrical equipment

About 24 percent of US transformers, electric motors, generators, switchgears, relays and controls are manufactured in the Midwest. Wisconsin and Illinois each have more employees in this industry than anywhere else in the US, accounting for 10 and 8 percent of the national total, respectively[12].

Transmission and powertrain parts

About 37 percent of US transmission and powertrain part manufacturers are located in the Midwest, in close proximity to vehicle manufacturers[13].

Explanation of Economic Model and Method

This case study compares the economic benefits associated with growth in the hybrid powertrain market in the Midwest, in two different scenarios: the "policy" scenario and the "no-policy" scenario.

The main difference between the two scenarios is the effect that climate and energy policies have on the size of the domestic HEV market.

How do the three policies affect the hybrid powertrain market?

1) A "green" economic stimulus program: ARRA included $2.4 billion in grants to vehicle and electric components manufacturers[15].

2) A price on carbon of $17 per ton resulting from a cap on US emissions: A price on carbon increases gasoline prices, leading to increased demand for more fuel efficient automobiles, like HEVs[16].

3) A national renewable electricity standard of 20% by 2020: A renewable electricity standard does not have a major impact on the hybrid powertrain market.

Findings of the size of the domestic HEV market in the "no policy" scenario are based on publicly available forecasts from the industry market research firm IBISWorld[17]. IBISWorld estimates that US hybrid sales will equal 5% of total US vehicle sales in 2010 and 17.7% of total US vehicle sales in 2015.

These figures are consistent with projections by JPMorgan Chase, which estimate that US hybrid sales will be 19.4% in 2020[18].

These forecasts are considered optimistic by some industry sources, and therefore may overstate the economic impacts if the hybrid market is smaller than these predictions state. However, in our judgment, they are the most credible estimates available.

Findings of the size of the domestic HEV market in the "policy" scenario start with the IBISWorld forecast for US hybrid sales, and account for increases in hybrid sales that result from an increase in gasoline prices, due to a $17 price on carbon. Increases in gasoline prices are based on a combination of US DOE and US EPA forecasts. The impact that increased gasoline prices have on hybrid purchases is based on a study by Harvard University[19].

While ARRA included over $1 billion in grants for electric vehicles, we do not include this funding in our findings, due to the difficultly in assessing the impact they will have on the HEV market at this time. In this regard, our findings may understate the economic impacts.

Increases in market revenue resulting from increases in HEV production, are distributed across Midwest states based on the location of existing factories[20].

Direct and indirect effects on market revenues, tax revenue and job creation impacts were then estimated using a commercial input-output model (IMPLAN).

Additional Assumptions

Regional growth based on existing factory locations. We make the assumption that growth in the HEV market will occur in the same locations as it has in the past. This may not be the case, and would have an impact on the state-level estimates if it were incorrect. However, without any way to predict the location of new HEV manufacturers, we felt that the past was the best available indicator.

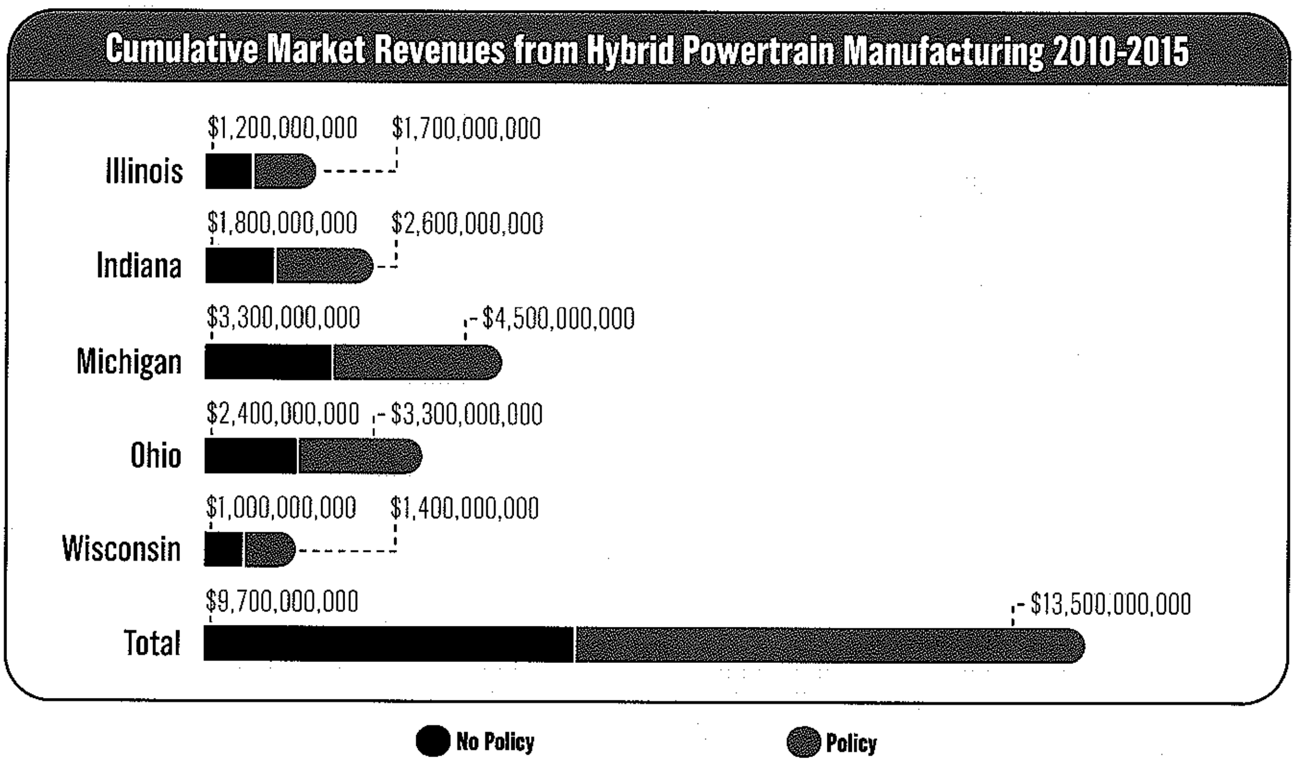
Findings

Market Revenues

By 2015, the "policy scenario" leads to $3.8 billion more in hybrid powertrain revenues in the Midwest than the "no policy" scenario.

The most striking feature of market revenue from the production of hybrid powertrains in the 'policy' scenario is the growth in the near term - including $663 million in 2010 alone.

The combination of policies creates steady growth for the manufacturing industry over the five-year period, generating more than $13 billion in market revenue for the automotive manufacturing industry.

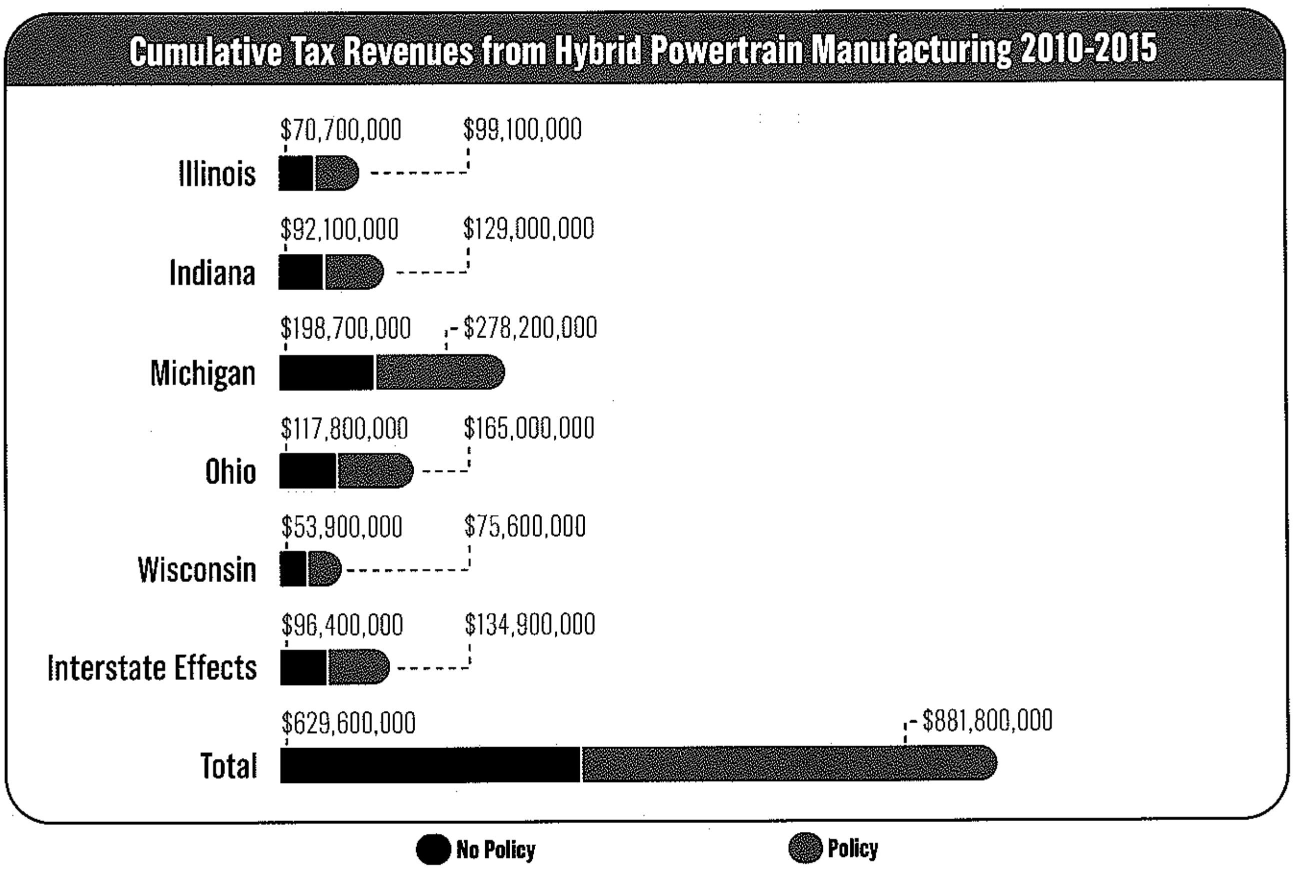


Tax Revenues

Over the next five years, the "policy" scenario generates $252 million more in state and local tax revenues than the "no policy" scenario.

In Michigan, this translates to about $79 million in additional tax revenues over five years, and more than $14 million in 2010 alone.

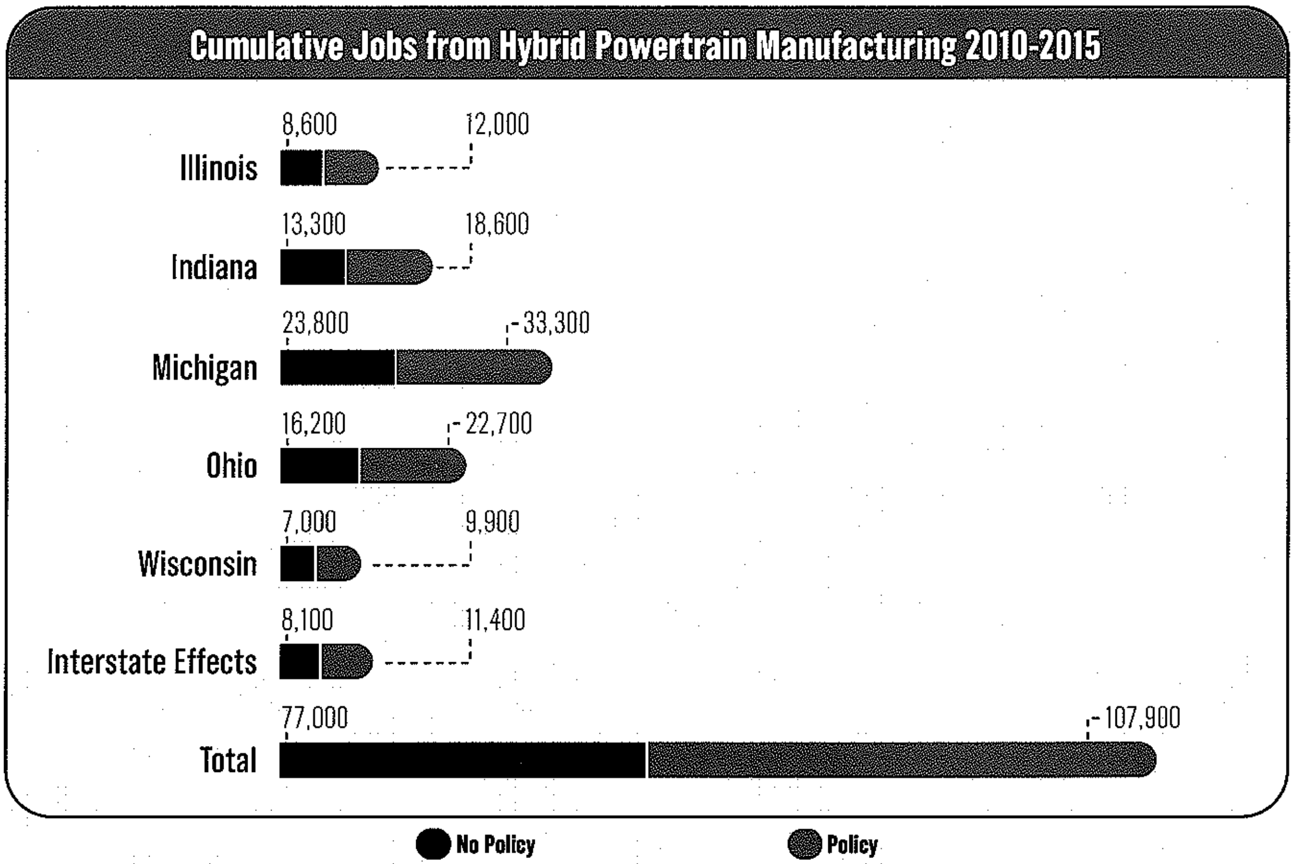
Michigan, Indiana and Ohio have the largest tax benefits.

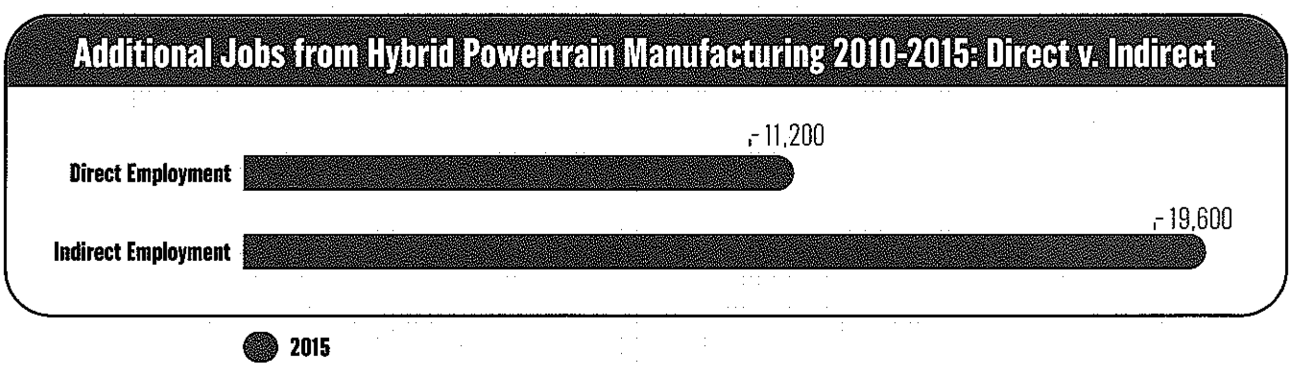


Job Creation

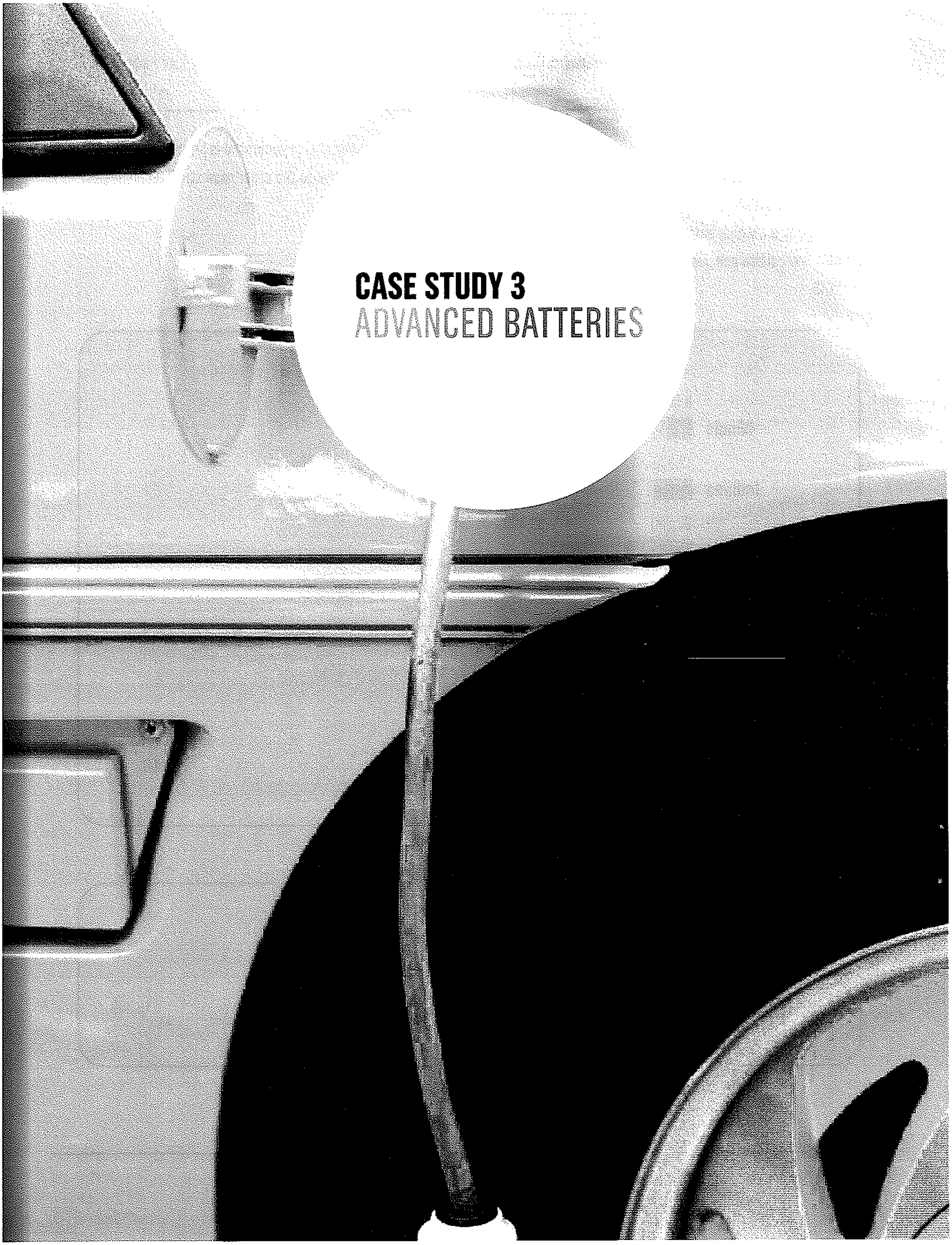
The policy scenario generates nearly 11,200 more direct jobs and 19,600 more indirect jobs than the 'no policy' scenario by 2015. In Michigan, which employs the most people in this sector, new low-carbon policies would create 9,500 additional jobs by 2015.

The total number of jobs generated is largest for hybrid powertrains relative to the other case study technologies.





CASE STUDY 3
ADVANCED BATTERIES



CASE STUDY 3 ADVANCED BATTERIES

Our case study on advanced batteries found that the three climate and energy policies would lead to modest new market revenues, state and local tax revenues and jobs.

In the "policy-low share" scenario, where the US supplies 10% of the domestic advanced battery market, we estimate $295 million in additional market revenues, $18 million in additional tax revenues and more than 2,300 new jobs in the Midwest by 2015.

In the "policy-high share" scenario, where the US supplies 50% of the domestic advanced battery market, we estimate $1.4 billion in additional market revenues, $90 million in additional tax revenues and 11,900 new jobs in the Midwest by 2015.

The Advanced Battery Market

Batteries are most closely tied to the automotive sector.

A small number of companies dominate the US battery industry, with four companies accounting for two-thirds of domestic revenue in 2009 - including Johnson Controls, headquartered in Milwaukee, WI, Exide Technologies, Energizer and Procter & Gamble (Duracel). Companies tend to be located near automotive and consumer electronics manufacturers, primarily in the Midwest and Southeast[1].

Companies within the battery market manufacture a number of different types of batteries for different applications. The market includes nickel metal hydride (NiMH) and lead acid storage for vehicles, as well as alkaline, nickel cadmium, lithium-ion (Li-ion), and mercuric oxide for consumer electronics, flashlights and marine applications[2].

Currently, nickel metal hydride is the dominant battery technology used for hybrid electric powertrains in the United States. However, Li-ion[3] batteries are expected to become the dominant technology for electric powertrains in the future, because they store more energy per mass and volume and have twice the cell voltage of other batteries.

Li-ion batteries are expensive - costing about $10,000 per battery - and they support a limited driving range of about 100 miles. Yet the current infusion of investments into Li-ion research and development is expected to reduce cost and yield a longer lasting, higher capacity, and safer battery.

As the production of HEV vehicles increases, demand for Li-ion batteries is expected to grow. The demand from US automakers alone could create an $11 billion to $13 billion market, according to Ford Motor Company[4].

Whether the United States captures a significant share of this emerging market will depend on its ability to adapt its current supply chain, equipment, and infrastructure. Currently, less than 1 percent of advanced batteries are produced domestically[5].

In a testimony before the House Subcommittee on Energy and Environment, Steven Chalk of the US Department of Energy stated: "The vehicle fleet of tomorrow will include more and more hybrids. There is a pressing need to establish the facilities to manufacture those batteries in the United States"[6].

[3] The term "lithium-ion" refers to a family of battery chemistries that includes many varieties with different strengths and weaknesses.

The effort to develop domestic Li-ion battery manufacturing facilities is underway. ARRA included $2.4 billion to fund research and development for advanced batteries[7].

More than 20 Midwest businesses and educational institutions have received almost $1.5 billion of these grants[8]. For example, the United States Advanced Battery Consortium recently awarded the Wisconsin-based Johnson Controls-Saft Advanced Power Solutions $8.2 million to develop a complete plug-in hybrid electric vehicle (PHEV) system over the next two years, and Ford Motor company received $205 million for HEV and PHEV development[9].

In August 2009, General Motors announced its plans to build the first US high-volume lithium-ion factory in Brownstone Township, Michigan[10].

Explanation of Economic Model and Method

This case study compares the economic benefits associated with growth in the advanced battery market in the Midwest, in two different scenarios: the "policy" scenario and the "no-policy" scenario.

How do the three policies affect the advanced battery market?

4) A "green" economic stimulus program: ARRA included $2 billion for the development of advanced batteries in the US.

5) A price on carbon of $17 per ton resulting from a cap on US emissions: A price on carbon increases gasoline prices, leading to increased demand for more fuel efficient vehicles, like HEVs, which use advanced batteries.

6) A national renewable electricity standard of 20% by 2020: A renewable electricity standard does not have a major impact on the advanced battery market

The main difference between the two scenarios is the effect that climate and energy policies have on the size of the domestic advanced battery market.

Findings of the size of the domestic advanced battery market in the "policy" scenario are based on the publicly available forecast from Ford Motor Company, which estimates that the US advanced battery market could be worth $11 billion to $13 billion by 2015.

However, it is uncertain how much of this new market will be supplied by domestic manufacturers. To address this uncertainty, we project the economic benefits associated with two scenarios: a "high share" scenario and a "low share" scenario. The "high share" scenario assumes that the US supplies 50% of an $11 billion domestic advanced battery market in 2015. The "low share" scenario assumes that the US supplies 10% of an $11 billion domestic battery market in 2015.

These market share estimates represent our effort to benchmark potential impact on the Midwest and are not intended as a forecast of how much production will or can be supported by 2015.

[8] Note that when companies with multiple locations received grants, it was assumed the grant was allocated equally across locations.

Because the US advanced battery market is so new - current production is less than one percent of the global market - the size of the domestic advanced battery market in the "no policy" scenario is assumed to be zero.

In each scenario, national revenues from the production of advanced batteries were allocated to the Midwest states based on each state's current percentage of national advanced battery shipments, according to US Census data defined by NAICS code 3559.

While the overall impact of ARRA is considered, the state specific distribution of stimulus funding for advanced batteries is not. As a result, our findings may underestimate the impact on states that received a relatively large percentage of this funding.

Direct and indirect effects on market revenues, tax revenue and job creation impacts were then estimated using a commercial input-output model (IMPLAN).

Findings

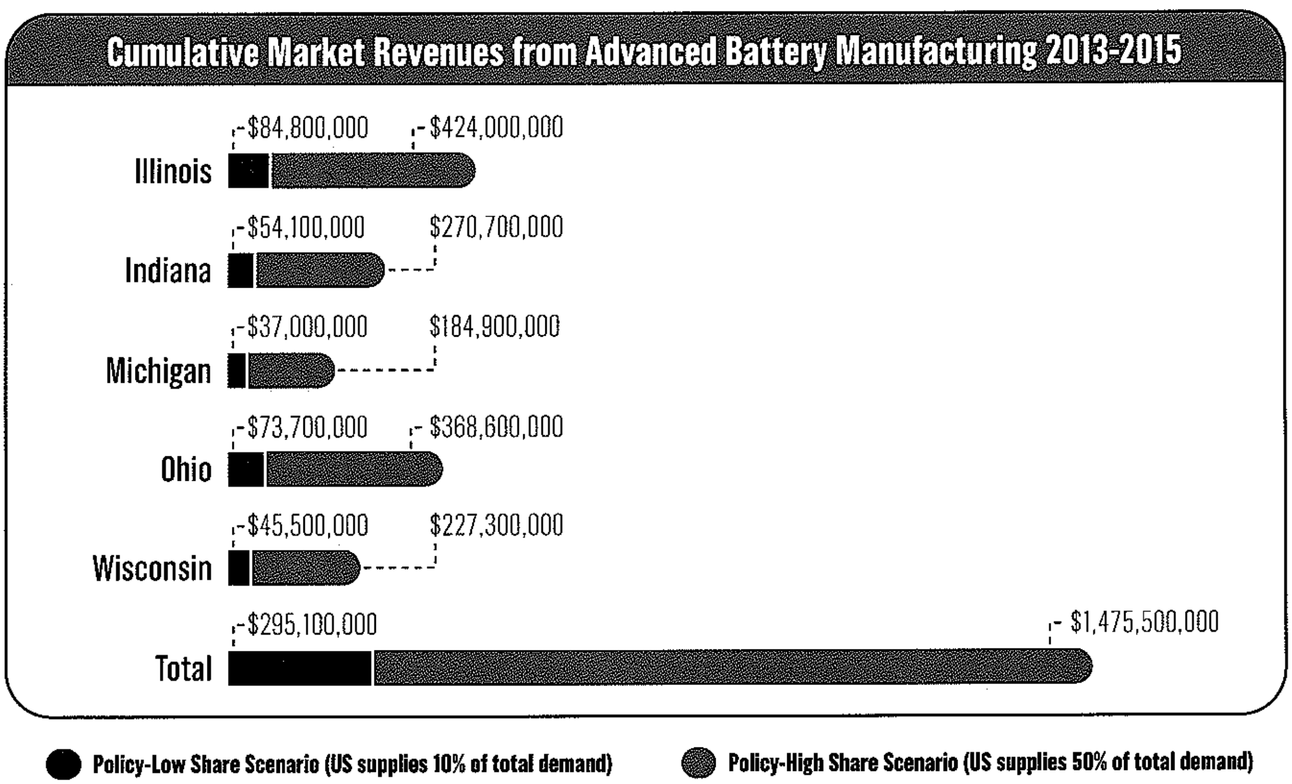
Market Revenues

In the "policy-high share" scenario, manufacturing revenue from the advanced battery market in the Midwest would grow to about $1.5 billion by 2015. Market revenues in Illinois would reach around $424 million, with Ohio closely following at about $370 million.

In the "policy-low share" scenario, the advanced battery market in the Midwest would grow to $295 million, with individual state revenues ranging from $37 million to $85 million by 2015.

All market revenue growth is new, as the existing advanced battery market is de minimis today. This represents an entirely new manufacturing sector, especially for Michigan, Indiana and Ohio.

Revenues attributed to Michigan are lower than expected as the state has already received over half of the $2 billion distributed through ARRA in fall of 2009.



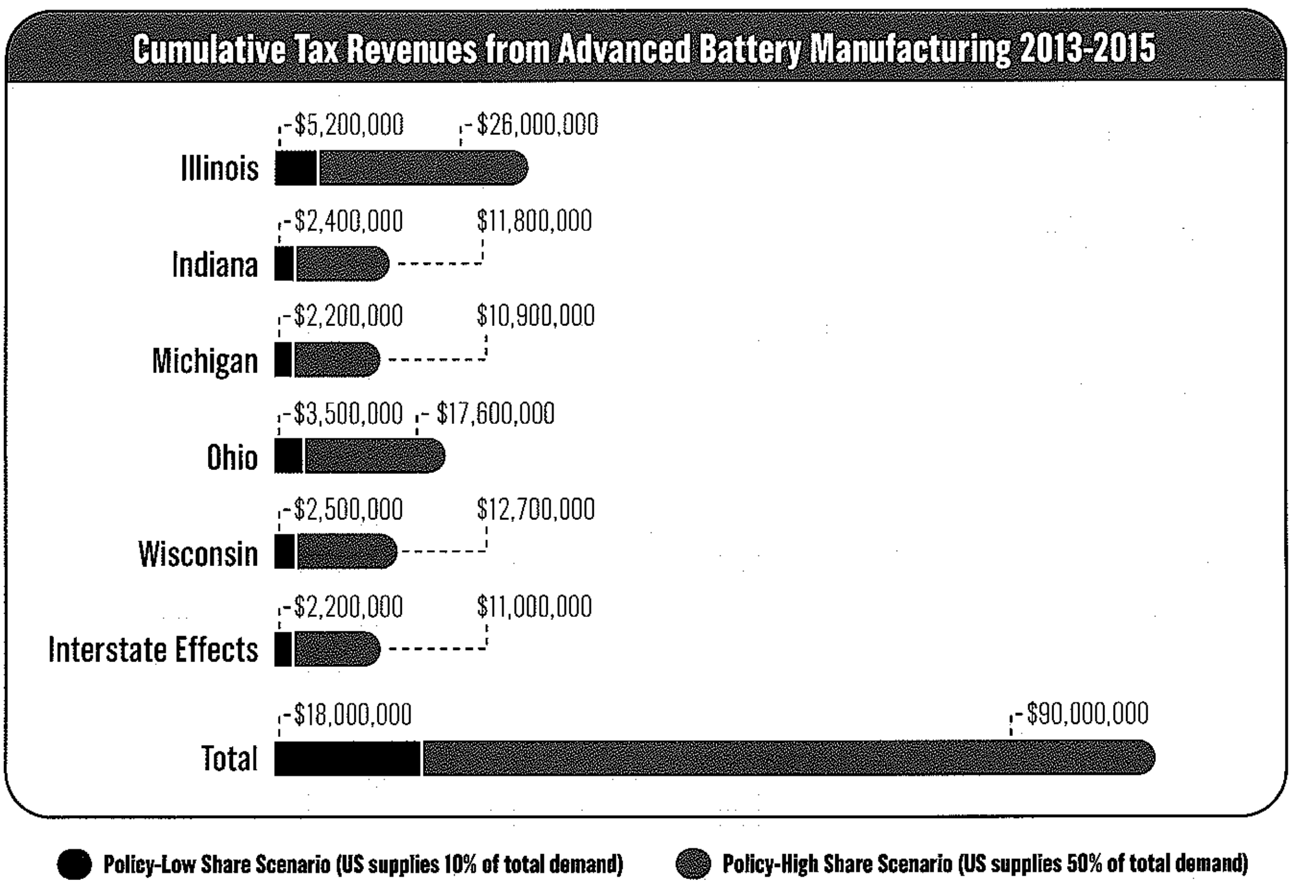
Because the US currently supplies less than one percent of the global advanced battery market, the size of the domestic advanced battery market in the "no policy" scenario is assumed to be zero.

Tax Revenues

In the "policy-high share" scenario, the Midwest would see additional tax revenues of about $90 million from 2013 through 2015. Illinois would see revenues of about $26 million, with Ohio gaining about $17.5 million.

In the "policy-low-share" scenario, the Midwest would see additional tax revenues of almost $18 million, with individual state revenues ranging from $2.2 million to about $5.2 million.

Tax revenues are distributed through the region and show that the initial benefits from breaking into the advanced battery market will benefit the entire Midwest.



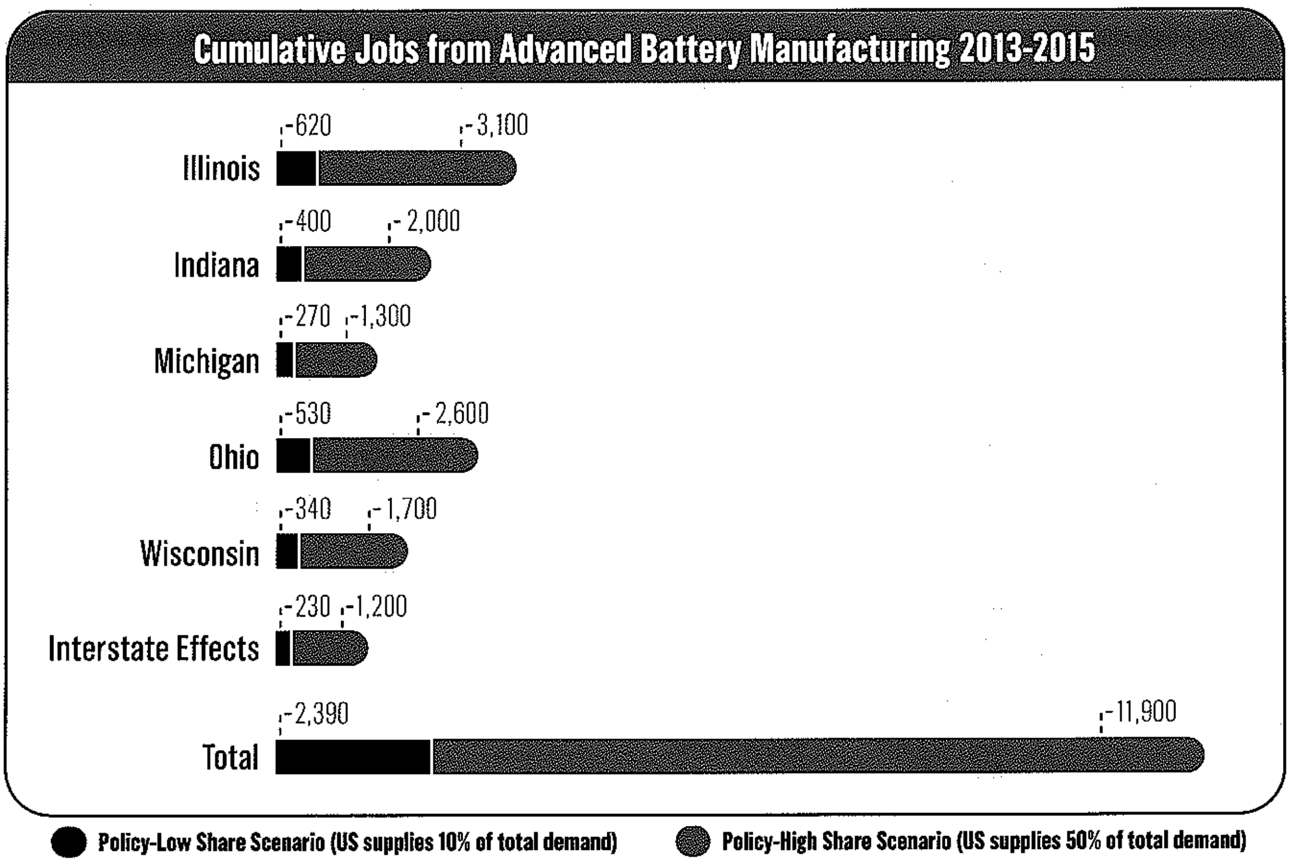
Because the US currently supplies less than one percent of the global advanced battery market, the size of the domestic advanced battery market in the "no policy" scenario is assumed to be zero.

Job Creation

The five Midwest states would see modest job growth in this sector by 2015 in both scenarios.

In the "policy-high share" scenario, more than 11,900 total jobs and approximately 5,000 direct jobs are created by 2015.

In the "policy-low share" scenario, about 2,400 total jobs and 1,000 direct jobs are created by 2015.



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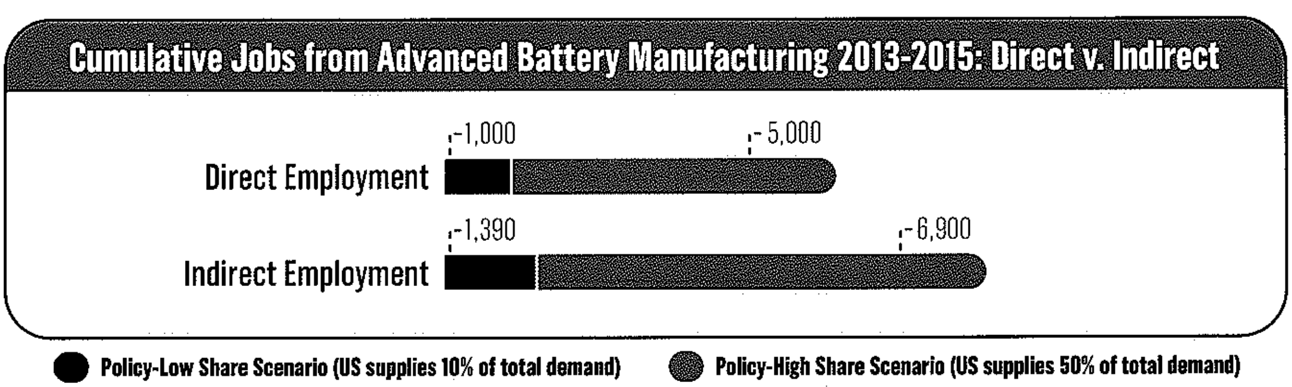

Because the US currently supplies less than one percent of the global advanced battery market, the size of the domestic advanced battery market in the "no policy" scenario is assumed to be zero.

CONCLUSION

As global demand for clean energy increases, new, clean energy jobs will multiply exponentially. The question is: "Who will get them?" One possible answer is the Midwest.

The Midwest has a storied history based on determination, innovation and hard work.
In the twentieth century, the United States was the global manufacturing leader – and the Midwest stood at the center of that production. For over fifty years, this manufacturing economy made it possible for men and women to earn middle class wages and create multiple generations of skilled workers. The Midwest was home to the largest steel maker, US Steel, and the biggest car company, General Motors, and retains a competitive advantage in these industries.

Because of this competitive advantage, the Midwest is uniquely positioned to capture new low-carbon manufacturing jobs.

This report shows that, with climate and energy policies in place, the Midwest would see additional market revenues of up to $12.3 billion, additional tax revenues of up to $812 million and up to 104,640 new jobs from the wind turbine component, hybrid powertrain and advanced battery manufacturing sectors by 2015.

With the distribution of stimulus funding throughout 2009, we are already starting to see these numbers come to life. A123 is expanding their advanced battery plant in Livonia, Michigan which will create 500 jobs and will open a new plant in Romulus, Michigan. General Motors produced its first mass produced electric car battery in Brownstown, Michigan in early January. And Brevini Wind's gearbox plant in Delaware County, Indiana received $12.8 million in tax credits, putting Hoosiers to work.

Our report is only part of the total picture. We do not examine the costs associated with these policies. And we do not consider all of the economic benefits associated with climate and energy policies, including substantial energy efficiency savings, new jobs created outside of the manufacturing sector, benefits from the manufacture of hundreds of additional low-carbon technologies not examined in this report, and opportunities to export these low carbon technologies to other countries.

But this report does offer a sense of the enormous potential for job creation in the Midwest with smart climate and energy policies in place.

It will take vision and hard work to create the kinds of policies needed to incentivize the low-carbon economy.

But climate and energy policy offers us a chance to ensure that the Midwest – indeed America– has a bright, clean and prosperous future.

APPENDIX

Overview: State of the Midwest Manufacturing Sector

More About Our Choice of Technologies and Selection Criteria
The initial set of technologies analyzed for the report included those considered by McKinsey & Company in their report "Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?", independent research, and selection by The Climate Group[1] and "Manufacturing Climate Solutions," by the Center on Globalization Governance & Competitiveness, 2009[2]. Those technologies that were clearly not relevant to the sectors considered in the report (automotive, chemicals, machinery and primary metals industries), were not well defined, or were extremely speculative were screened out on a first-pass review. The set of initial technologies was narrowed to about fifteen based on initial screening criteria, including a technology's relevance to economic activity in the Midwest in the near term.

For all technologies, the process was to: 1) research external data sources; 2) discuss the data findings; and 3) gather qualitative responses from team members, to determine overall rankings for the technologies. The technologies were grouped into "baskets" based on which of the four noted sectors they were most closely aligned.

The fifteen technologies were then refined to a smaller set, based on a rigorous application of criteria. Criteria were ranked qualitatively as being of high, medium, or low importance. Weights were assigned to each importance level, and the criteria were ranked based on the group's informal survey responses. The weights defined by the team members' rankings were totaled for each criterion and placed in order, as shown in the following table.

Criteria	Importance
1. Is the manufacture and/or a substantial portion of the product's value chain concentrated in the Midwest?	High
2. Does the Midwest have a comparative advantage in production?	High
3. How many years to show value/impact from the use of the technology?	High
4. Is the technology proven or in development?	High
5. What is the availability of relevant and appropriate data?	High
6. Is the technology a target for stimulus dollars?	High
7. What's the level of public understanding of the technology?	High
8. Can a market be defined for the technology or product?	High
9. What's the cost of abatement per ton of CO_2 equivalent (CO_2e) emissions?	Medium
10. How good of a substitute is this technology for an existing technology?	Medium
11. What's the potential reduction of CO_2e?	Medium
12. Are there significant capital costs related to the development or production of the technology?	Low
13. Will suppliers at any point in the value chain change because of the use of the technology?	Low
14. Does the technology generate large positive externalities or "free ridership"?	Low
15. Are there complements?	Low
16. Does the technology require widespread adoption to generate measureable benefits?	Low

Additional information about each criterion and its assessment, indicated by criterion number:

(1), (2) The technologies were categorized using US Census production data for 2002 and 2006 at the six-digit NAICS level to determine relative values in the Midwest and the nation[3]. The productivity indicators collected for each technology by state included the number of establishments, total revenues, annual payroll, and number of employees. The information by state was totaled to define amounts in Michigan, Illinois, Indiana, Ohio, and Wisconsin. Other data were derived to obtain a better understanding of a technology's overall importance to the Midwestern economy and to be used as more formal selection criteria to compare the study region to the nation, including the percentage of establishments, revenue, and employees. Technologies (identified by NAICS code) with a significant portion of national revenue produced in the Midwest were defined as having a significant proportion of the Midwest value chain; those with a significant proportion of payroll to revenues by state were defined as having a comparative production advantage in the Midwest.

(3) Two factors were considered relevant to the question of timing: increased value of the technology to the economy and reduction in carbon emissions. Technologies impacting the economy and reducing carbon emissions in the near term were considered preferable to those with a longer horizon.

(4) Less speculative technologies are more likely to have reliable data to measure economic impacts.

(5) Information should be current, consistent, and reliable, as well as publicly available, when possible.

(6) Whether the technology was the target for stimulus dollars had a strong relationship with its relevance to policymakers and public visibility.

(7) A technology well-understood by the public is more likely to be adopted and to have measurable impacts on the economy and on CO_2e emissions.

(8) Measurement of economic impacts is better quantified for a technology with a well-defined market, versus a market that is imprecise or unclear.

(9) As defined by the McKinsey report, in 2005 real dollars: "The cost of an abatement option reflects its resource (or techno-engineering) costs, i.e. capital, operating and maintenance costs, offset by any energy savings associated with abating 1 ton of CO_2e per year using this option, with the costs/savings levelized over the lifetime of the option using a 7 percent real discount rate. We have excluded transaction costs, communication/information costs, taxes, tariffs, and/or subsidies. We also have not assumed a 'price for carbon' that might emerge as a result of legislation, nor any impact on the economy of such a carbon price. Hence, the per ton abatement cost does not necessarily reflect the full cost of implementing that option."

(10) Self-explanatory.

(11) As defined by the McKinsey report, in per year CO_2e amounts over a 25-year period[4].

(12) High up-front capital could slow investment or implementation.

(13) Employment or production displacement due to the adoption of a technology.

(14) A large divergence between private and public benefits could affect a technology's adoption.

(15) Complements are goods that are produced or consumed jointly, such as peanut butter and jelly. If the technology has many complements, there will likely be faster adoption.

(16) Technologies requiring a large number of independent individual choices to adopt were considered less likely to be widely adopted.

More About Our Case Study Selection

The technologies in the refined selection pool were ranked qualitatively for each of the criteria. As with the criteria ranking, each criteria for each technology had a value. These values were summed across each technology, and the technologies were ranked according to the summed value.

- At the end of this process, hybrid powertrains, advanced batteries, and wind power components were judged to be the most appropriate for this study.
- Other technologies can and should be analyzed. Only a select group was chosen due to budgetary constraints.
- The technologies were partially chosen based on their crossover into the four sectors analyzed.

About the Findings

Once the technologies were chose, the first step in the analysis was to research each technology to understand its market, its state of development in the US and the Midwest, and the internal and external forces driving the technologies' adoption and acceptance. To calculate the impact on the Midwest economy, after the technology was well defined and modeled, relevant data was collected so that a traditional economic impact analysis could be conducted. Through all modeling phases, analysis was conducted through the use of publicly available data and published research.

- The time horizon for modeling was determined to be 5 years.
- Data was culled from public sources, such as the US Census Bureau, the US Department of Energy, and publicly available academic journals, newspapers, magazines, and online sources.
- The product market for each technology was defined, including sub-products if relevant.
- Supply conditions were analyzed for producers in each market and sub-market, considering factors such as capacity, utilization, and barriers to entry.
- Demand conditions were analyzed for each market and sub-market, including whether the product market is local or national, the number of consumers, and price sensitivities.
- The baseline growth rate for the technology was considered.
- Changes in exogenous factors were evaluated, including a carbon price, and how these changes would impact the technology's producers.
- Net impacts were analyzed through a traditional economic impact analysis.

The IMPLAN model was used. IMPLAN is widely used by US state governments and private corporations.

Policy Options Considered

Cap-and-Trade Policy

This study considers the implementation of a cap-and-trade program on greenhouse gas emissions. Under such a program, covered entities would be required to hold one allowance for each ton of CO2 equivalent emissions. The analysis is based on the American Clean Energy and Security Act of 2009 (ACES), which passed in the US House of Representatives on June 26, 2009[5].

ACES has a set number of allowances available each year, ranging from 4.627 billion in 2012 to 5.056 billion in 2020. Allowances could be banked for future use and borrowed up to five years in advance. Covered entities can use offsets to meet a portion of their allowance requirements; five offsets are required for every four tons of CO_2e emissions. Offsets are awarded for qualified projects that lower net CO_2 emissions unrelated to the covered entity's operations, such as preventing deforestation. Offsets are capped at 2 billion tons a year program-wide: 1 billion domestic offsets, and 1 billion international offsets. Programs established in ACES also have an impact on the growth of wind-generated electricity.

American Recovery and Reinvestment Act of 2009 (ARRA)

This study considers ARRA in the wind turbine component case study. ARRA provides an extension through 2012 of the Production Tax Credit (PTC), originally established by the Energy Policy Act of 1992 and adjusted annually for inflation. The PTC equaled $0.021/kWh in 2008. With wind energy production averaging $0.04/kWh, the PTC represents a 50 percent credit on production. ARRA also allows renewable energy projects placed in service by the end of 2012 to choose an upfront Investment Tax Credit (ITC) or cash grant in lieu of the PTC. Manufacturers of qualified renewable energy technologies also qualify for the ITC, with a cap of $2.3 billion. Projects electing the ITC or cash grant are no longer susceptible to the "double dipping" penalty. Other advantages under ARRA for qualified renewable and transmission projects include expedited depreciation timelines, loan and borrowing guarantees, funding opportunities for projects and research and development, and financial support for state renewable electricity programs[6].

National Renewable Electricity Standard (RES)

State renewable portfolio standards (RPS) have a significant effect on the demand for wind energy. To promote renewable energy generation, several states have set target goals for electricity distributors. In most state RPS programs, electricity distributors are expected to meet a target percentage of generation by renewable sources before a set date; while some states simply have a kWh goal for the total state's generation. The current state RPS programs vary widely: The transition to a national RES of 20 percent by 2020 and modernization of the electric grid in ACES would aid in wind energy growth[7].

Case Study 1: Wind Turbine Components

More About the Wind Turbine Market

Demand for wind power, absent special incentives or subsidies, ultimately depends on its cost to electricity users. Currently, wind power costs about twice as much as new coal power per kilowatt-hours (kWh). Wind currently costs $.04/kWh on average, with a fairly broad range of prices nationally; 50 percent of wind power supplied falls between $.033 and $.0515/kWh[8 & 9] compared to an average o $.02/kWh for new coal plants.

Wind Turbine Components and Sub-Components

Components	NAICS Code	NAICS Description
ROTOR		
Blade	326199	All other plastic products
Blade extender	331511	Iron foundries
Hub	331511	Iron foundries
Pitch driver	335312	Motors and generators
NACELLE AND MACHINERY		
Anemometer	334519	Measuring and controlling devices
Brakes	333613	Power transmission equipment
Controller	334418	Printed circuits and electronics assemblies
Cooling fan	333412	Industrial and commercial fans and blowers
Nacelle case	326199	All other plastic products
Nacelle frame	331511	Iron foundries
Sensors	334519	Measuring and controlling devices
Yaw Drive	335312	Motors and generators
GEARBOX AND DRIVETRAIN		
Bearings	332991	Ball and roller bearings
Coupling	333613	Power transmission equipment
Gearbox	333612	Speed change industrial
High- and low-speed shafts	333613	Power transmission equipment
GENERATOR		
Generator	333611	Turbines, and turbine generators, and turbine generator sets
Power electronics	335999	Electronic equipment and components
TOWER		
Tower	332312	Fabricated structural metal
Tower flange	331511	Iron foundries

Potential Cross-over Factories

Factories in the US and in the five Midwestern states that are producing in the same NAICS codes as the turbine components and sub-components parts and could conceivably enter into turbine component production are listed in the table below[10].

Wind Turbine Component and Sub-Component Factory Distribution

Sub-Component	US Total	Illinois	Indiana	Michigan	Ohio	Wisconsin
Rotor	10,327	629	443	733	776	413
Nacelle and machinery	12,425	703	458	829	851	440
Gearbox and drivetrain	1,030	88	41	69	79	68
Generator	1,089	65	35	36	45	22
Tower	3,780	167	155	184	253	113

Additional Assumptions

- **Distribution of new turbine expenditures along the supply chain.** In 2004, 50 percent of blades, 26 percent of towers, and 20 percent of remaining parts were produced domestically, potentially rising to 80 percent, 50 percent, and 42 percent respectively by 2030[11]. For the purpose of this study it was assumed that annual growth was linear[12]. Once total domestic expenditures were calculated, the "remaining parts" category expenditures were further broken down into nacelle/machinery (47 percent), gearbox/drivetrain (38 percent), and generators (15 percent).
- **Growth rate.** We assumed a constant growth rate in domestic production in order to obtain domestic production estimates annually up to 2015.
- **Wind capacity.** Annual wind capacity growth was calculated and multiplied by an estimated capacity-weighted average turbine production cost of $1,360 per kilowatt, to get the total US expenditures by year[14].

Domestic Cost Allocation of Wind Turbine Components and Sub-Components

Components	Cost Allocation by Component	Domestic Production 2004	Forecast Domestic Production - 2030[13]
Rotor	28%	50%	80%
Nacelle and machinery	21.7%	20%	42%
Gearbox and drivetrain	17.3%	20%	42%
Generator	7%	20%	42%
Tower	26%	26%	50%

[12] It is possible that the growth assumptions used in this paper are conservative and will underestimate the shift from foreign to domestic production and hence economic and fiscal impacts. To the extent that "Buy American" provisions are effectively implemented in ARRA and other policies, the shift could be larger and much more rapid.

Case Study 2: Hybrid Powertrains

More About the Automotive Sector

The "Cash for Clunkers" program, which concluded on August 24, 2009, generated almost 700,000 new car sales[15]. According to Ford Motor Co. representatives, many of these were deferred purchases from earlier in the year; in other words, consumers planning on trading their vehicles waited to do so to take advantage of the rebate. Approximately 30 to 40 percent of vehicle sales were incremental sales, according to Ford representatives, to customers who would not have otherwise purchased a new vehicle[16&17].

Vehicle manufacturers selling in the US market are affected by government standards for minimum fuel consumption (known as Corporate Average Fuel Economy, or CAFE). In May 2009, President Obama announced that an automakers' fleet of vehicles will have to average 35.5 miles per gallon (mpg) by 2016. Cars will average 39 mpg, while light trucks will average 30 mpg. This allows automakers to have individual vehicles that get above or below the set mpg, as long as the entire fleet averages 35.5 mpg[18]. These more stringent standards will reinforce a trend to move toward HEVs and other more fuel-efficient technologies.

The Obama administration's award of $2.4 billion in grants to US-based manufacturers in early August to support the manufacture of advanced batteries and other components for electric cars breaks down as follows[19]:

- $1.5 billion to produce batteries and their components and to expand battery recycling capacity.
- $500 million to produce electric drive components for vehicles, including electric motors, power electronics, and other drive train components.
- $400 million to purchase thousands of plug-in hybrid and all-electric vehicles for test demonstrations in several dozen locations; to deploy them and evaluate their performance; to install electric charging infrastructure; and to provide education and workforce training to support the transition to advanced electric transportation systems.

[17] No adjustments are made to forecast revenue, due to the statistically small sales figures.

More About the HEV Powertrain Market

HEV costs can be broken down by component, with the powertrain and its sub-components accounting for 55 percent of total costs.

HEVs: Component Share of Vehicle Cost[20]	Major Component Category %	Component Category Detail %
POWERTRAIN	55%	
Engine, fuel delivery, exhaust & emissions, inverter		12%
Electric motor		10%
Drivetrain[21]		12%
Battery[22]		21%
Other		
Body frame	17%	17%
Other systems	28%	28%
Total	100%	100%

[21] The base source (see Pill Soo-Kim) grouped the drivetrain with the engine, fuel delivery, exhaust, emissions and inverter. Together these represented 24 percent of the component cost of a vehicle. In a conventional powertrain, the drivetrain has been estimated to represent 13 percent of vehicle cost. For a hybrid drivetrain, the cost was estimated at 12 percent; half of 24 percent total.

[22] For a nickel metal hydride battery

NAICS 33631: Motor vehicle gasoline engine & engine parts manufacturing

Companies in this industry manufacture or rebuild gasoline engines, manufacture engine parts such as valves and pistons, and produce carburetors, fuel, oil and water pumps, and intake and exhaust systems. Gasoline engines are by far the largest product of this industry, and are forecast to comprise about 86 percent of industry revenue in 2009. Crankshafts and parts follow with 6 percent of industry share; with pistons and related equipment, carburetors and valves accounting for the remaining 7 percent[23]. Over the past five years, vehicle engines within the 3.0-3.9L size have been losing popularity to smaller, 2.9L and under, engines. A similar shift has occurred for light trucks since 2002.

Motor vehicle gasoline engine & engine parts manufacturing

NAICS 33631 - USA[24]	2005	2006	2007	2008	2009	Units
Industry revenue	36, 210.2	37,486.8	45,800.0	33,795.2	30,111.5	$Mil
Imports as a share of domestic demand	31.34	27.86	29.34	27.47	26.58	%

NAICS 33531: Electrical equipment manufacturing

Motor and generator manufacturing are forecast to comprise about 34 percent of the value of industry shipments in 2009, up from 29.1 percent in 2002[25]. Industry revenue is expected to increase, on average and in real terms, by 3.6 percent annually in the five years through 2014. Growth will be driven by an increase in domestic demand for industry products[26].

Electrical equipment manufacturing

NAICS 33531 -- USA[17]	2005	2006	2007	2008	2009	Units
Industry revenue	37,582.2	39,439.4	40,946.2	40,112.5	34,420.5	$Mil
Imports as a share of domestic demand	41.18	43.65	45.27	46.9	50.63	%

NAICS 33635: Motor Vehicle Transmission and Powertrain Parts Manufacturing

The major products manufactured in this industry include transmissions and parts (42 percent), axles and parts (32 percent), and drivetrain components (26 percent)[28]. Demand for transmission and powertrain parts fell over the five years to 2009, and industry revenue contracted by 6.7 percent annually to $28.8 billion. Manufacturers have dealt with cost increases in fundamental raw materials such as steel as expansion in emerging economies put upward pressure on the prices of these inputs. Several parts manufacturers filed for bankruptcy. In 2009, manufacturers in this industry continued to struggle[29].

Motor Vehicle Transmission and Powertrain Parts Manufacturing

ICS 33635 - US[30]	2005	2006	2007	2008	2009	Units
Industry revenue	38,535.4	37,364.8	37,566.4	33,131.1	28,797.6	$Mil
Imports as a share of domestic demand	27.58	28.81	26.93	28.1	29.43	%

About the Policy Assumptions

- The Cash for Clunkers program has not materially impacted demand for vehicles over the forecast period. No adjustments have been made to sales forecasts presented in the IBISWorld auto and truck industry studies.
- CAFE standards are implicit in sales forecasts presented in IBISWorld's industry studies and in findings beyond 2015. No explicit adjustments have been made for the impact of these standards.
- Tax credits for PEVs and EVs have not been explicitly considered, as it is not possible to predict consumer adoption rates for these vehicles
- These models have not been adjusted to account for the Obama administration's grants to promote EVs. It is not possible to predict the impact that these policies will have.

About the Methodology: HEV Powertrains

The first step in developing an estimate for demand for hybrid powertrains was to forecast the demand for hybrid vehicles over the forecast period, then calculate the demand for, and value of, each component of the hybrid powertrain in each forecast year. This data was then broken down by state, based on US Census data, and then by component by NAICS code.

- Forecasts for total US sales of light trucks, SUVs[31] and automobiles[32] are based on IBISWorld expectations for 2010 through 2015. The compound annual growth rate (CAGR) from 2010-2015 for autos was 2.3 percent. The CAGR for light trucks and SUVs was 1.9 percent from 2010-2015.
- Across all years, forecasts for vehicles were adjusted to exclude imports. According to IBISWorld, in 2009, 49.8 percent of domestic demand for vehicles was for imported vehicles[33]. For light trucks and SUVs, 37.9 percent was for imports in 2009[34]. There was no indication of how demand would shift during the forecast period; therefore, these import percentages were held constant through the forecast period.
- US hybrid sales, as a percentage of total US vehicle sales, were forecast by IBISWorld for 2010, 2013, and 2015 at 5, 11, and 17.7 percent respectively[35]. Forecasts of US hybrid sales as a percentage of total US vehicle sales for inter-years (i.e. 2011, 2012, 2014, and 2016-2019) were calculated through linear extrapolation. Revenue from sales of domestically produced hybrids was calculated for 2010 through 2015.
- The proportion of value for each component was adjusted to allow for the portion of engine value that is imported[36]. There was no indication of how demand might shift during the forecast period; percentages were held constant at 2009 values and formed the basis of the dollar value attributed to national production of the component parts.
- The dollar value of revenue attributed to domestic production was allocated to Illinois, Indiana, Michigan, Ohio, and Wisconsin based on total value of shipments by state as a percentage of total value of national shipments, according to US Census data defined by four digit NAICS codes[37]. This formed the basis of the 2010 scenario.
- A price of $17 per ton of CO_2e would add approximately $0.172 to the price of a gallon of

[36] For gasoline engines, the value of imported components is about 26.6 percent of gasoline industry value. Of the 12 percent of hybrid value attributed to gasoline engines, about 74.4 derives from domestic production and thus this value was adjusted accordingly.

gasoline, according to industry research[38]. To model the change in consumer behavior based on this price change, we relied on a study by two Harvard University researchers that found that for a 10 percent increase in gas prices, US hybrid purchases increased by 7.5 percent based on data from 2002 to 2006[39].

- Base gasoline prices over the forecast period (in real dollars) are based on IBISWorld forecasts for 2010-2015[40&41].
- To calculate how demand would change, $0.172 was added to the forecast price of gasoline (in constant dollars) in each year. The percentage increase in the total price per gallon was then calculated for each year. The resulting incremental increase in demand for hybrid vehicles was calculated, based on the Harvard University study[42,43&44].
- Because the forecast for all model components was in real dollars, and the price of gasoline is forecast to increase over the forecast period in real dollar terms, the percent increase in price per gallon and the resulting expected increase in the purchase of hybrid vehicles were more significant in earlier years in the model. The percent increase in price per gallon over the base price ranged from 6.5 percent in the first model year to less than 5 percent in the final model year. The corresponding incremental increase in value of HEVs purchased ranged from about 5 percent in the first model year to just over 3.5 percent in the final model year.

[43] The impact of the shift away from the purchase of other, non-hybrid vehicles was not measured. However, because hybrid powertrains are considered to add a premium of approximately $2000-$3000 to the value of a vehicle over a non-hybrid counterpart much of the value of a hybrid powertrain is truly a value-add, and not a value shift.

Case Study 3: Advanced Batteries

About the Methodology & Assumptions: Advanced Batteries

- The elements of demand are not differentiated by factors driven by a carbon price, by tax credits, or direct subsidies to industry.
- Domestic production of advanced batteries by the Midwest states defined for this study is maintained at the proportional value demonstrated by 2006 NAICS code 3359.
- The base case scenario, in keeping with the status quo, assumes the US would produce an immaterial amount of advanced batteries to satisfy demand, and thus assumes no carbon price, and no impacts from subsidies, tax credits or other programs. In essence the US would produce zero value of this market demand over the finding period.
- These models have not been adjusted to account for the Obama administration's grants to promote electric vehicles. It is not currently possible to predict the impact that these policies will have on the distribution of benefits to individual states and regions.

Barriers to Realizing Benefits: Advanced Batteries

- Li-ion batteries must become more cost effective before they can be widely adopted.
- Consumer acceptance of Li-ion batteries may develop differently than expected. Consumers may be hesitant to adopt such new and relatively unproven technology, which may slow development and adoption of advanced batteries.

GLOSSARY

2009 Dollars
IMPLAN output figures reported in 2007 dollars. Output reported in 2009 dollars using GDP deflators given by Price Indexes for Gross Domestic Product reported by Bureau of Economic Analysis.

AEO 2009
The Annual Energy Outlook 2009 (AEO2009) presents findings and analysis of US energy supply, demand, and prices. Findings are based on results from the Energy Information Administration's National Energy Modeling System.

ACES
American Clean Energy and Security Act of 2009. Also known as Waxman-Markey, this comprehensive energy bill includes a cap-and-trade plan designed to reduce greenhouse gas emissions 17 percent by 2020. Other provisions include new renewable requirements for utilities, studies and incentives regarding new carbon capture and sequestration technologies, energy efficiency incentives for homes and buildings, and grants for green jobs.

Amines
Amines are basic organic compounds used during carbon capture and storage (CCS) to separate carbon dioxide from other gases when coal is burned.

Anemometer
An instrument that measures wind speed and transmits wind speed data to the controller.

ARRA
The American Recovery and Reinvestment Act of 2009 which included $787 billion in economic recovery funds distributed through grants, tax breaks and loans.

CAFE standards
Corporate Average Fuel Economy standards, first established in 1975 under the Energy Policy Conversation Act and updated several times since. In May 2009, President Obama announced that an automakers' fleet of vehicles will have to average 35.5 miles per gallon (mpg) by 2016.

CAGR
Compound annual growth rate

Carbon footprint
Impact of human activities on the environment measured in terms of GHG produced, communicated in CO2e.

Cap and trade/cap-and-trade policy
An emissions trading scheme that sets an overall limit on the emission of a certain pollutant and allows participating entities to trade emission allowances.

CBO
Congressional Budget Office

CCS
Carbon capture and storage. A method to reduce GHG emissions by capturing carbon dioxide from large factories and fossil fuel power plants and storing it deep underground or deep in the ocean.

CFMMI
Chicago Federal Reserve Bank's Midwest Manufacturing Index

CO_2e
Carbon dioxide equivalent. A standard unit, measured in metric tons, of GHG emissions.

CHP
Combined heat and power systems, also known as cogeneration.

Drive train
In a hybrid vehicle, the components of the powertrain that transmit power from the engine to the wheels.

EESA
The Emergency Economic Stabilization Act of 2008

Enzymes
Biological catalysts capable of speeding up biochemical reactions in manufacturing, reducing the amounts of raw materials needed.

EPA
US Environmental Protection Agency

EV
Electric vehicle

FDIC
Federal Deposit Insurance Corporation

GHGs
Greenhouse gases. A group of gases that absorb and re-emit infrared radiation. These gases occur through both natural and human-influenced processes and include: carbon dioxide, nitrous oxide, methane, sulfur hexafluoride, hydrofluorocarbon, and perfluorocompounds.

HEV
Hybrid electric vehicle. Hybrid vehicles combine a conventional internal combustion engine propulsion system with a rechargeable electric storage and propulsion system.

HVAC
Heating, ventilation and air conditioning

Hybrid powertrain
Hybrid powertrains include four major components: the engine, fuel delivery, exhaust & emissions and inverter; electric motor; drivetrain; and advanced battery. In a hybrid powertrain, an electric motor provides power to assist the engine. Conventional powertrains do not have electric motors or inverters.

Hybrid vehicle
Automotive vehicle with an electric motor and a traditional internal combustion engine.

Inverter
A device that converts direct current (DC) to alternating current (AC).

ITC
Investment tax credit.

kWh
Kilowatt-hour

Lightweight vehicles
Vehicles made with lighter materials to improve fuel-efficiency by reducing vehicular weight.

Li-ion
Short for lithium ion, these batteries come in various forms and can store more energy per mass and volume than traditional batteries.

Nacelle
In a wind turbine, the nacelle sits atop the tower and contains the gear box, low- and high-speed shafts, generator, controller, and brake.

NAICS
The North American Industry Classification System is the standard used by federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the US business economy.

NAICS codes
The numerical codes assigned to each NAICS sector.

PV
Photovoltaic solar cells convert light from the sun directly into electricity.

PHEV
Plug-in hybrid electric vehicle

PTC
Production tax credit

RES (renewable electricity standard)
RESs mandate a percent of electricity be generated from renewable sources. Legislation has been introduced into the US Congress to create a national RES.

Smart Grid
Integration of ICT (information and communication technology) applications throughout the grid, from generator to user, to enable efficiency and optimization solutions.

Wind turbine components
Wind turbines can be broken down into five major components: rotor, nacelle and machinery, gearbox and drive train, generator, and tower. Each of these components corresponds to a six-digit NAICS code.

Yaw drive
Upwind turbines face into the wind; the yaw drive is used to keep the rotor facing into the wind as the wind direction changes. Downwind turbines don't require a yaw drive.

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